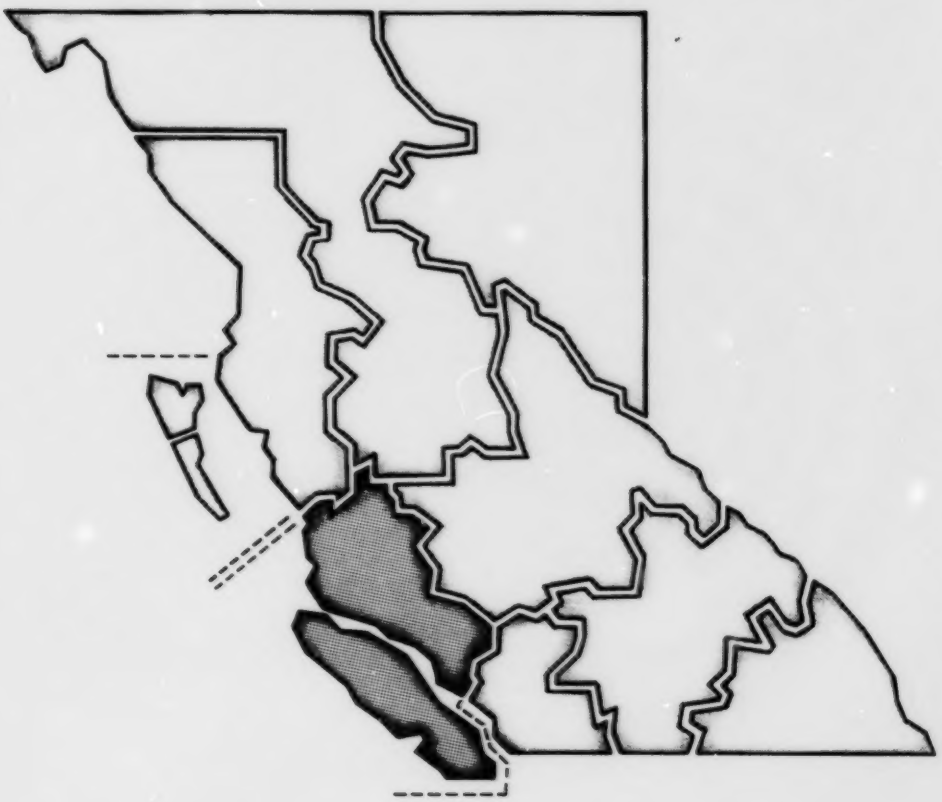
VANCOUVER ISLAND/COAST REGION TELECOMMUNICATIONS INFRASTRUCTURE NEEDS ASSESSMENT STUDY

The Compendium Report to the:
Vancouver Island/Coast Telecommunications Strategy
The Report of the Strategic Communications Subcommittee of the
Innovation and Technology Task Force



Prepared by
Intelecon Research & Consultancy Ltd.
February 1992

Canadian Cataloguing in Publication Data
Vancouver Island/Coast Innovation and Technology Task Force (B.C.). Strategic Communications Subcommittee.
Vancouver Island/Coast Region telecommunications infrastructure needs assessment study

Includes bibliographical references.
ISBN 0-7726-1518-7

1. Telecommunication - British Columbia. I. British Columbia. Ministry of Economic Development, Small Business and Trade. II. Intelecon Research & Consultancy Ltd.

HE7818.B75 1992 384'.09711 C92-092114-0

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This report is a compendium to the report entitled "Vancouver Island/Coast Telecommunications Strategy", and provides a detailed evaluation of the telecommunications infrastructure in the region, current and future user needs and knowledge, and strategic initiatives in other jurisdictions around the world. This report is not meant to be a stand-alone document, but rather provides technical support to the "Telecommunications Strategy". The report was prepared under the direction of the Strategic Communications Subcommittee of the Vancouver Island/Coast Innovation and Technology Task Force by Intelecon Research & Consultancy Ltd.

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Dr. Andrew Woodsworth, Dominion Astrophysical Observatory

Ministry Assistance Provided By:
Mr. Allan Collier, Director, Technology and Communications Industries Branch
Ms. Lisa Gow, Manager, Vancouver Island/Coast Region, Development Regions Branch

1.0 OVERVIEW OF REPORT

1.1 Background

The Vancouver Island/Coast Region has identified advanced technology and knowledge-based industries as a driving force in the diversification and economic development of the region. An innovative and affordable telecommunications infrastructure is seen as being as important to the development of these and other industries as are other infrastructures, such as transportation, power and social services.

1.2 The Study

INTELECON Research & Consultancy Ltd was engaged by the Vancouver Island/Coast Technology and Innovation Task Force to undertake a study entitled *Telecommunications Infrastructure Needs Assessment*. The study objectives were to assess telecommunications facilities and services available to the region, and to determine the adequacy of these services and facilities both with respect to existing needs and demands, and with respect to future needs and opportunities for the region.

The study is the first step in the development of a strategy for telecommunications infrastructure development in the Vancouver Island/Coast region. In accordance with the Terms of Reference, the investigations were carried out as five discrete activities, as follows:

- A *Communications Inventory*, profiling the existing status, accessibility and development plans of all major telecommunications infrastructure facilities and services in the region.

- An *Inventory of Current User Needs and Knowledge*, which established the degree of knowledge or understanding of the infrastructure services by existing and potential users, and their level of satisfaction with the services.

- An *Evaluation of Strategic Initiatives* in other Jurisdictions, where telecommunications has been used to promote economic development, for their relevance to the region.

- An *Identification of Predicted Communications Needs* for existing and potential users in the region.

- An *Identification of Potential Projects* which could be undertaken through the auspices of the Vancouver Island/Coast Technology and Innovation Task Force, to stimulate the use of information technology and communications in the region.

The first three of these activities are summarized in this report. A compendium report entitled *A Telecommunications Strategy for the Vancouver Island/Coast Region* provides an overview of these activities, together with a summary of the analyses undertaken to complete the final two activities. It includes the final recommendations to the Task Force.

1.3 Report Contents

This report describes in detail the study findings from the three primary areas of investigation, and is organized as follows:

1.3.1 Part B: Communications Inventory

The network facilities and services of the telecommunications common carriers, BC Tel and Unitel, CATV companies, cellular companies and all other special purpose or private network operators were surveyed. More than 20 networks and the services they provide are described in the report. They are also tabulated as to their geographical coverage of the region in a detailed network database. Their current users, access and availability restrictions, user costs and expansion or enhancement plans are described and tabulated.

For the purposes of the infrastructure analysis, 79 localities in the Vancouver Island/Coast region were identified, based on their having at least one K-12 school. This was taken as a proxy for population size and community socio-economic viability. The description and tabulation of network coverage in the region is thus referenced to these communities.

1.3.2 Part C: Inventory of Current User Needs and Knowledge

More than 80 organizations representing ten different economic or market sectors were interviewed to determine their degree of knowledge and understanding of the current infrastructure and the services offered, their level of satisfaction with the services, and their need for enhanced or lower cost facilities to better serve their needs. The survey sought to establish their level of usage or future demand for a wide range of applications, from fax and electronic mail to high speed imaging and videoconferencing.

The report summarises the responses descriptively on a sector-by-sector basis, identifies the primary applications which will require significantly higher speed communications and, finally, tabulates the current and future penetration of the different applications.

1.3.3 Part D: Overview of Other Strategic Initiatives

A wide range of published and unpublished sources was consulted to review major strategic initiatives or policies pursued by other jurisdictions. Details were obtained of more than 30 initiatives in the European Economic Community, Sweden, Australia, Japan, Singapore and various parts of the United States. These were analyzed for their relevance to the British Columbian situation.

The report contains detailed appendices tabulating the initiatives studied and summarizing their application to the BC situation. Those holding particular interest for BC, from Scotland, Wales, France, Sweden, Singapore and the USA are given prominence in the conclusion.

2.0 INTRODUCTION AND METHODOLOGY

2.1 General

The communications inventory provides a summary of the facilities and services of all the major network operators in the region, arranged under the following headings:

- Common Carrier Networks
- Cellular Networks
- Satellite Networks
- Long Distance Reseller Networks
- Private Telecommunications Networks
- Value Added Networks
- CATV Networks & Systems

Where appropriate, brief descriptions are provided for each network, stating their geographic coverage, the services they offer, and their technical and terminal support capability. Major expansion or development plans are identified.

2.2 Geographical coverage

2.2.1 Place Names

For analysis purposes, 79 localities have been identified in the Vancouver Island/Coast Region. These have been chosen based on the existence of at least one K-12 public, independent or native community school in the locality. This classification has been preferred over other criteria, such as population size or the number of businesses, for two main reasons, namely:

- The presence of a school indicates the existence of a viable community. Other amenities, such as businesses and a library, will most likely be found where schools are found.

- Schools are a prime target for the diffusion of information technology and will likely require data network facilities in the next few years.

A number of the localities also have higher education institutions, however this does not affect the selection criterion since all such localities also possess at least one K-12 school.

2.2.2 Regional Maps

A series of standard maps of the region, with the 79 localities coded for size, are used to represent various aspects of the communications inventory. For the reasons already explained, the number of schools per locality has been taken as a proxy for population and community size.

The map identifies four categories of locality, namely:

- those with just one school
- those with 2-10 schools
- those with more than 10 schools, and
- Greater Victoria, which has over 90 schools

A total of 399 K-12 schools were identified in the region. These include 18 in native communities, most of which are within or contiguous with localities having other public or private schools. Three, namely Klemtu, Waglisla and Kingcome Inlet have no non-native schools and are therefore identified separately.

2.2.3 Network Coverage

For the major infrastructures, the geographical extent of each network has been indicated by a map or diagram. In addition, each network operator's services have been described in the report as well as represented in tabular form (in Appendix B1). The tables indicate the various types of network termination, bandwidth or services offered to the network's clients. The tabular format reflects both the comparative extent of each operator's facilities and services, and the differences between places in the region as regards facilities available.

2.3 Facilities and Services Database

A Lotus 123 based model, for which print-outs are provided in Appendix B1, is used to tabulate:

- existence &/or in-service plan dates for transmission, switch and concentrator facilities
- availability of individual network service offerings
- data service bandwidths
- no. of customer terminations (in some cases)
- population of community
- number of schools & higher education institutions
- key industries & users of telecommunications

The use of a spreadsheet for the database allowed manipulation of the data and calculations, for purposes such as determining the relative status of localities as regards service availability.

3.0 EXISTING NETWORK FACILITIES AND SERVICES

3.1 Common Carriers

3.1.1 BC Telephone Company

BC Tel's position as the regulated common carrier for the provision of telecommunications in the Province means that it provides universal telephone service to virtually the whole of BC. It has transmission systems and central office switching exchanges serving all of BC and the geographical area studied. It also has wideband cross-border interconnections with the USA and with all of the world's national and international networks via the gateway switching and transmission facilities of Teleglobe.

The Vancouver Island/Coast Region represents approximately 17.5% of BC Tel's total business, according to the number of telephone subscribers. Approximately 320,000 of the company's 1.83 million lines are located in the region.

At the present time, the technology in place and the availability of the most advanced services varies significantly from place to place. However, BC Tel has embarked on province-wide investment program totalling $1.6 billion over the next five years. This will include expenditures of over $200 million expanding and upgrading the facilities on Vancouver Island. Digital services will be extended to virtually all of the main population centres, as far north as Port Hardy and including those centres which are outside of the eastern coastal strip. The Coast area will also have its transmission facilities upgraded towards the end of the same period.

BC Tel's plan is to have leading edge "Broadband" facilities available in all major cities and towns throughout the province, including the Vancouver Island/Coast Region, by 1997. Under certain circumstances, for which BC Tel has made presentations to the BC Government, this plan could possibly be advanced by up to five years.

BC Tel's services to data communication users and to private network operators are provided in competition with *Unitel*. Unitel is able to utilise a combination of its own facilities (which amount to less than 10% of BC Tel's in total circuit miles) and bulk discount agreements with BC Tel, to provide the basic infrastructure for a number of major private networks in the province. These include the Provincial Government networks operated by *BC Systems Corporation*, and the *Insurance Corporation of BC* and *BC Lottery Corporation* networks.

The following provides a more detailed summary of BC Tel's network facilities and services, as tabulated in the inventory.

Transmission

A map showing BC Tel's transmission systems in the Vancouver Island/Cost Region is provided in Appendix B2.

Digital microwave transmission systems, with minimum DS3 (45 Mbps) bandwidth capacity link Victoria to Vancouver, and extend from Victoria to Port Hardy, with branches reaching to Port Renfrew, Port Alberni, Bamfield, Ucluelet, Tofino, and several of the Gulf Islands. The branch systems may be equipped with only T1 (1.5 Mbps) multiplex, however this can be expanded as the market demand justifies. Digital microwave will be extended to virtually all other population centres in the north Island and Coast by 1995.

BC Tel optical systems now extend from Victoria to Parksville, and are in place within the communities of Courtenay, Comox and Campbell River. The Victoria area has optical facilities and a major lease arrangement with BC Systems Corporation has provided a *Metropolitan Area Network* for the BC Government.

In 1992, a dual optical fibre ring, shared with Teleglobe Canada, will be in place linking the mainland with Vancouver Island at two places (Chemainus and Qualicum) and extending to the international gateway facilities at Port Alberni and Lake Cowichan.

The fibre network is planned for extension to Sooke and Saltspring Island by 1994. Synchronous Optical Network (SONET) interworking will be available to high speed data users in Victoria, Duncan, Nanaimo and Port Alberni by 1994.

Of the 79 places in the inventory list, 24 of the more remote localities, representing approximately less than 3% of the region's population, are still linked to the network by analogue radio. Almost all of these systems will be replaced by digital microwave over the next five years. Twenty locations are served with copper cable (with digital PCM multiplex).

Four localities in the list, all in the north Coast area, are currently served only by radio call systems or Autotel (BC Tel's radio mobile service).

Switching

BC Tel's central office exchanges are predominantly GTE GTD-5 digital switches. These allow users to have most of the commonly available digital exchange features (see *Services* below). Many of the GTD-5 exchanges in the south of the Island are to be upgraded to work with Common Channel Signalling System # 7 (CCS7) in the 1991/92 time frame. This paves the way for the more advanced *Call Management Service* features such as

incoming call identification, and eventually for the *Integrated Services Digital Network (ISDN).*

The introduction of ISDN is currently planned for mid 1992. Twelve BC communities will be served by the end of 1993. In the Vancouver Island/Coast region, this will include only the Victoria area in 1992. Nanaimo is currently slated to receive service in April 1994. ISDN will provide home or business customers with the relative luxury of a 144Kbps digital service, comprising two 64 Kbps voice/data circuits plus a slower speed data channel. These will be usable in a fully flexible manner for voice telephone, fax, electronic mail, image transmission, etc. However, the effective use of ISDN will depend, to a large extent, on the development and marketing of application software which meets customer demand, by third party companies and value added service providers.

Many of the main GTD-5 offices between Victoria and Campbell River will be upgraded to the more advanced Northern Telecom DMS switches between 1993 and 1996, extending the possibility for ISDN further afield, although BC Tel's plans for the wide area introduction of ISDN have yet to be confirmed. However, it should be noted that a few key communities, such as Courtenay/Comox and Port Alberni, are not slated for DMS technology until after 1997.

26 of the localities studied (representing approximately 20% of the region's total subscribers) are still served by older technology switches, comprising analogue stored program control (SPC) and electro-mechanical (Strowger) types. This limits the exchange based services available to customers in these communities. However, most can still access a few of BC Tel's data services (eg. *Envoy 100, Inet 2000* and *Datapac*) although the transmission speeds possible on dial-up access may be limited.

The current breakdown of subscriber lines by the type of switch serving them, as supplied by BC Tel, is as follows:

Switch Type	Number of lines	Percentage
GTD5/DMS100 Digital	252,577	79%
Other Digital	2,894	1%
Analogue SPC	58,317	18%
Electro-mechanical	6,764	2%

The majority of the analogue switches now in place will give way to DMS technology by 1996/97, thus potentially bringing virtually the whole of the region into the ISDN serving area.

Services

The availability of a broad and representative basket of BC Tel basic and value added services was surveyed, in order to develop as complete a picture as possible of the situation for customers throughout the region. BC Tel was also requested to provide tariff and pricing information. Although this is difficult to summarise in the tabular presentation, sufficient guidance on prices was obtained to be able to make some general observations.

The services surveyed were the following:

- SMART Features - Available on most digital exchanges and include *Call Alert, Call Forwarding, Three-way calling* and *Smart ring.* Paid for individually or as a package.

- Business Pac - A package of enhanced, digital exchange features for small business customers who do not have their own PABX or electronic key telephone system, or who share office space with others. The features include *Alternate Answer, Call Transfer* and *Call Pick-up* and are paid for individually or as a package.

- Call Management Service - A set of five enhanced network features, still under CRTC application, which will give residential and small business customers greater control over incoming and outgoing calls. The proposed service will be available only to touch-calling equipped customers served by exchanges equipped with the CCS7 signalling system.

- FaxCom - Discounted dedicated fax or data line service for customers with more than $45 per month in facsimile or data long distance charges. Costed on a fixed fee plus long distance charge basis.

- WATS - Long distance bulk discount scheme, provided on a dedicated line, for high volume calling to specific destinations.

- Teleplus & Advantage - General long distance discount schemes with various fixed fees and break-even points.

- 800 Service - One way long distance plan allowing businesses to have callers contact them toll-free from designated areas. The fixed costs assume a certain basic minimum call usage, plus discounted toll charges above the fixed cost.

- Remote Call Forwarding - Allows a business to have a telephone number in a remote calling area. The service is costed as a one-time service charge plus monthly rental and toll charges.

- Envoy 100 - Electronic Mail Service, with Envoy Post and message to fax capability. The costs are time and usage sensitive.

- Inet 2000 - On-line access from computers and terminals to public and private sector databases and various other retrieval systems. Costs are time and usage sensitive.

- Traderoute - Electronic Data Interchange (EDI) service linking computers for the exchange of common form documents. Applicable to businesses and industries with transaction-oriented communications needs. Costs include a one-time service charge, monthly fee and usage charges.

- Teleconferencing - Allows three or more locations to be simultaneously connected. Call set-ups can be operator handled (where the conference initiator pays the whole bill) or via "bridging", where each participant dials into a common "meet-me" number and the costs are distributed.

- Video Forum - Full two-way, inter-active voice and image transmission service. Fees are charged on an hourly basis, plus studio rental if appropriate. The service is based to date on the use of 785 kbps (1/2 T1) compressed video codecs. As the technology progresses to allow the use of narrower band codecs, the cost of the service could reduce significantly.

- Information Service Access (ISA) - Provides a guaranteed circuit quality for customers wishing to access data services over the switched telephone network with a modem speed higher than 300 bps. This is generally available to customers served by a digital exchange.

- Private Line - dedicated two wire or four wire circuits may be leased for private network purposes, to carry voice or analogue data traffic. The terminal and network multiplexing equipment may be leased form BC Tel or owned by the customer. Data speeds of up to 19.2 kbps are feasible.

- Datalink - Switched, dial up, point-to-point data transmission service, with speeds of up to 56 kbps. Circuits are accessed with a *Digital Data Unit* on digital facilities. Users pay a one-time service charge, a monthly fee which is sensitive to transmission speed, and a distance-volume sensitive usage charge.

- Datapac - Packet switched data service, for low to medium volume users. Datapac can be accessed on analogue facilities. Fees are a one-time service charge plus, a monthly fee based on transmission speed, plus a volume based usage charge.

- Dataroute - Digital leased line for high volume users, providing connection between computers, terminals and Local Area Networks (LANs) at speeds of 1.2 to 9.6 kbps, 19.2 kbps and 56 kbps. Fees are a one-time service charge plus a monthly fee based on transmission speed and distance.

- Megaroute - Digital high capacity T1 or part T1 leased line for computer, network and PABX trunk group interconnection at 1.5 Mbps. Fees are a one-time service charge plus a monthly distance-based levy.

- Megastream - Canada-wide Digital inter-exchange private line service, which includes leased multiplex equipment. The data transmission rate is flexible. The service offers a range of applications to the user (eg. videoconferencing, CAD/CAM, high speed data).

- ISDN Basic Rate Access (BRA) - Will provide the basic 144Kbps customer connection for small businesses or telecommuters, comprising two 64 kbps voice/data circuits plus a low speed data channel. This service will be first introduced in mid 1992.

- ISDN Primary Rate Access (PRA) - Will provide a 1.5 Mbps multi-channel voice-data capability for larger businesses.

Geographic Coverage

As already noted, there is a considerable variation in the extent of BC Tel's services in the region. In particular, those which require digital exchanges (*SMART features, Business Pac, Faxcom, Remote Call Forwarding*) are currently not available in almost half (36) of the localities, although the proportion of the region's total population represented is, as already noted, only 7%.

The absence of a digital exchange does not preclude most of these communities from either the long distance discount services (800 Service, Teleplus, Advantage) or the business and data services which can be accessed through the analogue network (ie. *Teleconferencing, Envoy 100, iNet 200, Traderoute* and *Datapac*). However, in many cases they will be limited to data speeds as low as 300bps and in some cases additional long distance charges may be incurred to access the nearest node. This level of service is available to all but 11 of the communities studied.

The switched data service *Datalink* is only available to customers served by DMS exchanges and is to be replaced, in the medium term, by a switched 56 kbps service which will be available to a wider range of centres.

The dedicated digital data transmission services (*Dataroute, Megaroute* and *Megastream*) are currently available as tariffed services in only nine communities. These are the key population centres along the east coast of Vancouver Island, between Victoria and Campbell River. However, BC Tel indicated that any of these services could be made available, as special assemblies, in any of the locations served by digital radio or copper paired cable (see *Costs* below). Extensions can also be made over analogue transmission systems, with the appropriate conversion and multiplex equipment.

Private lines are available to customers in all localities having an analogue or digital transmission system and central office. Since the service is non-switched, it does not depend on the existence of a particular type of exchange.

As already noted, *ISDN* will be introduced in Victoria in mid 1992, with Nanaimo slated for 1994. Other communities can potentially have ISDN service as their switches are upgraded to DMS technology. Thus communities north of Nanaimo are not likely to receive ISDN until well into the 1994-97 period.

Digital Service Penetration

Over 98% of the telephone subscriber lines on Vancouver Island are served by a central office with some form of digital transmission facility (microwave or cable PCM carrier). The number will be even higher by 1995.

In terms of population for the whole Vancouver Island/Coast region, however, the penetration is slightly lower (around 97%). Almost one third (24) of the 79 localities studied, primarily the most remote, are served by analogue facilities.

As for the digital exchange based services, whereas only 80% of BC Tel's subscribers in the region are today served from digital switches, a further 13% are served from central offices where a digital switch is present. Thus advanced digital services could be made available to these customers with a subscriber number change.

Costs

The price of basic telephone service, ie. for local exchange service, is based on a "value for service" concept and is regulated by the CRTC. Specifically, the price of a line is related to the number of other lines that can be accessed for no charge, within the free calling area. Customers in large centres therefore pay more for their lines than those in smaller, more remote communities, despite the fact that very real economies of scale are usually

available to the telephone company in the larger centres. This pricing concept is inherent with Canada's *universal access* policy, which effectively encourages the socio-economic integration and development of the more remote communities.

The monthly rental cost of a business line in the Vancouver Island/Coast region ranges from $13.55 in Bella Bella to $41.85 in Sooke (which includes free calling to the whole of the Victoria/Saanich Peninsula area). The cost in the city of Victoria is $32.40. For comparison purposes, the business line rental cost in Vancouver is $48.25.

Despite having lower-cost basic service, however, users in smaller communities typically end up incurring more long distance charges if their business contacts fall outside their local calling area. This is unless they are able to use special private network access arrangements (in the case of dealing with the Government) or toll-free numbers such as the 800 service.

The long distance discount services and the enhanced digital exchange services (eg. *SMART features* and *Business Pac*) are priced universally, irrespective of location. The basic cost of the data services accessed through analogue facilities (ie. *Envoy 100, iNet 2000, Traderoute* and *Datapac*) are also universal. However, Datapac usage is priced on a "grade" basis, with Vancouver the only Grade 1 location. Victoria to Campbell River are Grade 2, and Port Hardy is Grade 3. Packet usage charges are considerably less (approx. 50%) within Grade 1, or to/from a Grade 1 area, than between lower grade areas.

For users outside of the free dialling area of a Datapac node, long distance charges must also be incurred to access the service. Initially, value added services such as Envoy 100, iNet and Traderoute could be accessed via a 1-800 number to the nearest Datapac node. However, the CRTC instructed BC Tel to remove this privilege, in the interests of maintaining fair competition between BC Tel and Unitel.

The tariffed fees for dedicated digital data services (ie. *Dataroute, Megaroute* and *Megastream*) are universal, based on transmission speed and distance. However, the size of the known demand for service will influence the cost to users in non-tariffed areas. "Special Assembly" prices apply in localities where a service is currently untariffed; these may be considerably higher than tariffed prices for the equivalent service elsewhere, because of higher marginal costs. The existence of a tariff implies that demand has already been identified, hence BC Tel's investment costs are likely to be averaged between a higher number of users than in the case of a Special Assembly.

The full tariffed cost for *Dataroute* includes the following components:

	9.6 kbps	19.2 kbps	56 kbps
■ service charge (one time)	$500	$700	$700
■ access charge (monthly, per end)	$150	$325	$325
■ termination equipment rental (monthly)	$50	$75	$75
■ network cost* (monthly, dist. related)	$520	$641	$1464

* The network cost is calculated on the basis of distance bands and is shown here for Victoria-Nanaimo, which is approximately 94 kilometres. The total monthly cost for this route thus ranges from $920 (for 9.6 kbps) to $2264 (for 56 kbps). The distance related cost, although not linear, brings sharp increases to the more remote locations. For example, the total monthly cost for Victoria-Port Hardy (390 km) is approximately double, ranging from $1712 (for 9.6 kbps) to $3110 (for 56 kbps).

In most cases, the cost of a long distance *Private Line* is 10-12% less than 9.6 kbps Dataroute and more than 40% less than the 19.2 kbps service. For example, a Victoria-Nanaimo line costs approximately $820, rising to $1490 for Victoria-Port Hardy. However, Private Line rates between two locations within the same exchange area may be more *much* less costly, due to significantly lower access charges. For example, a circuit between two locations just 10 km apart may be as low as $92 per month (2 Wire) or $175 (4 Wire), and costs just $200 to install.

The full tariffed cost of a dedicated *Megaroute* T1 (1.5 Mbps) line includes the following components:

- $9,000 per end up-front service (construction) fee
- approx. $550 monthly per end for access
- a monthly distance charge

Discounts are available for volume billing (the calculation of which takes a user's total usage throughout the province into account) and the length of contract. Typical discounts are 10% for a 1 year contract, 15% for 3 years and 22% for 5 years. The current monthly prices for a T1 *Megaroute* link on a 3 year contract, for users with a $50,000 monthly commitment, for four representative routes are as follows:

■ Victoria - Vancouver	(94 Km)	$8,483
■ Vancouver - Campbell River	(230 Km)	$13,724
■ Victoria - Campbell River	(266 Km)	$14,516
■ Victoria - Port Hardy	(504 Km)	$18,058

For *Megastream* service, the cost of multiplex terminals must be added, at a minimum of approximately $1,000 per end (depending on the number of terminal ports).

Video Forum could theoretically be provided in most key population centres. However, the service is currently available only in Victoria and Vancouver, with connection possibilities to virtually all the major cities in North America, Europe and the Pacific Rim. Rental costs depend on the amount of usage and the number and distribution of the end points and include two components: a network cost and a studio cost. Typical network prices for a simple end-to-end conference are as follows:

Victoria to:	Per 1/2 hour
Vancouver	$75
Toronto	$250
San Francisco	$350
Los Angeles	$400
New York	$440
Europe or Pacific Rim	* $1,750

The minimum conference time for international destinations is one hour (*$3,500 per hour). The studio cost is $75 per half hour at BC Tel and other Canadian locations (generally higher elsewhere).

The provision of Video Forum in locations other than Victoria and Vancouver would have to be on a special assembly basis. The cost would be related to *Megastream* network rates and depend heavily on the likely demand for video and other sub-T1 network applications in the localities involved.

Price Changes

Tariffed prices are declining in real terms due to both the general effect of inflation in the economy (which renders constant tariffs lower on a year to year basis) and to tariff price reductions on some services. For example, the monthly cost of a Vancouver-Victoria T1 Megaroute circuit (5 year contract) has declined by 40% over the past two years and is set to reduce by a further 11% when BC Tel's current tariff application (CBN-3) is approved.

3.1.2 Unitel Communications Inc.

Unitel is the main competitor to the Telecom Canada companies for private line voice, FAX and data services across Canada and to the US. It has also submitted an application to the CRTC to operate a competitive long distance telephone service. As such, Unitel's facilities are extensive nationally, though in BC they amount to only 10% of BC Tel's facilities, in terms of circuit miles.

Unitel has a Canada-wide microwave system, a fibre optic network near completion, and central office based switching systems in all of the major population centres. In BC, Unitel has a broadband interconnection with the USA at Aldergrove, with connection via microwave to Seattle where it connects with MCI, Sprint and other US carriers. Unitel is the main bulk carrier for the Long Distance Re-sellers (see Section 2.7), which are currently competing with BC Tel and other Telecom Canada companies on long distance telephone and data services to Canadian, US and overseas destinations.

Within the Vancouver Island/Coast Region, Unitel's transmission facilities comprise analogue and wideband digital microwave systems linking Victoria with the mainland and north to Campbell River, with central office terminations in Victoria, Duncan, Nanaimo, Courtenay and Campbell River. Unitel also has smaller central offices in Port Alberni, Port McNeil and Port Hardy which terminate BC Tel leased lines.

Outside the main centres of the Victoria-Campbell River corridor and in the Coast area of the mainland, therefore, Unitel services are provided over BC Tel's facilities. These are obtained by Unitel under a bulk lease agreement. Unitel does not currently have optical fibre in the region.

Services

Unitel's national services comprise the following:

- Facsroute - The competitor to BC Tel's *FaxCom*, a dedicated facsimile transmission service.
- Facsroute Plus - An enhanced service which includes features such as FAX broadcasting, least-cost or specific time delivery, and telex delivery via FAX.
- Analogue Private Line - Analogue point-to-point circuits for voice, PABX trunking or data applications.
- Broadband Exchange - Private switched telephone network which can be used for voice or data (to 9.6 kbps), suitable for multi-branched businesses.

- Infodat Digital Private Lines - The competitor to BC Tel's *Dataroute*, dedicated point-to-point digital circuits, with data speeds of up to 56 kbps.

- FasPac - Unitel's X.25/X.28 packet switched data service, providing computer and terminal interconnection at various speeds up to 19.2 kbps.

- Mach III - Unitel's competitor to BC Tel's *Megaroute* and *Megastream* services, providing digital wideband service which integrates voice trunking, high speed data and image transmission at speeds of 64 kbps to 1.5 Mbps and multiples thereof.

Availability and Costs

The economic provision of Unitel's full range of services is currently limited to locations where Unitel has main central offices. In the Vancouver Island/Coast region at least, this does not extend beyond the locations served by Unitel's backbone microwave systems, namely: Victoria, Duncan, Nanaimo, Courtenay and Campbell River. The smaller central offices in Port Alberni, Port McNeil and Port Hardy, which are linked to the network through BC Tel leased lines and currently offer only the *Analogue Private Line Service, Infodat* and *Mach III*.

Unitel's services are typically tariffed at up to 15% less than the equivalent BC Tel service in localities where Unitel has a central office. It is possible that the number of central offices will increase should Unitel be successful in its bid to provide competitive long distance public telephone service. However, Unitel's plans for the region are by no means certain, with or without approval of its CRTC application. In the meantime, the range of services for which Unitel can offer cost savings to users is limited to the main population centres.

3.1.3 Teleglobe

As Canada's international telecommunications carrier, Teleglobe provides the interconnection between BC Tel (and the other Telecom Canada carriers) and the world's networks. Teleglobe does not provide service to the USA, as this is handled directly by the Telecom Canada companies and Unitel.

Teleglobe operates the following facilities:

- An extensive earth station complex at Lake Cowichan, covering satellites over the Pacific and Atlantic Oceans and North America.

There are three Intelsat antennas. The first (Pacific Ocean) currently carries 982 international public telephone and leased circuits between Canada and other Pacific region countries, plus occasional use television. The second (Pacific Ocean) carries television as well as serving as a restoration (back-up) route for submarine cable traffic. The third (Atlantic Ocean) provides leased circuit and television service to countries of the Atlantic region. Lake Cowichan is in the unique position (not shared by any other station in North America) of being able to "see" both Intelsat's Pacific and Atlantic region satellites.

The station also has several antennas used for domestic North American satellite traffic.

- A Pacific Ocean cable terminal at Port Alberni.

  The ANZCAN cable carries 447 international public telephone and leased circuits between Canada and other Pacific region countries via Australia/New Zealand, plus international transit circuits between countries of both the Atlantic and Pacific regions. The total capacity of this cable is 1380 circuits.

  A new optical fibre cable will connect Port Alberni with the TPC-4 North America to Japan optical link in 1992. This cable, which will have a capacity of 50,000 voice circuits, will be interconnected with Teleglobe's fibre links to Vancouver (see below).

- An international switching centre (Gateway) in Burnaby.

  This connects all calls to/from BC Tel and other Telecom Canada customers with international destinations.

At present, Teleglobe's three major locations in BC are linked by transmission facilities leased from BC Tel on analogue microwave. In 1992 these will be replaced by an optical fibre ring network which is being constructed jointly by Teleglobe and BC Tel. This network will enter Vancouver Island, via two separate Georgia Strait crossings, at Chemainus and Qualicum, and will have considerable spare capacity, at least initially.

The international carrier business is currently undergoing change, as market liberalization spreads. However, Teleglobe was granted the continuation of its monopoly position over international public telephone traffic to/from Canada, for five years from its privatization date in February 1987. The CRTC is currently considering Teleglobe's future position. In the meantime, Teleglobe has been declared a "Reseller", which means that it is not

restricted to dealing only with Telecom Canada and Unitel. It is now able to offer international services to customers directly.

Through its *Globedirect* range of services, Teleglobe offers high-volume businesses the opportunity to realise considerable savings on international calls, by providing them direct access to the international Gateway in Burnaby. Teleglobe also offers a *Globefax* service and *Globetex* (a store-and-forward text messaging service). It also has a range of private network services, including *Globesat* (digital data by satellite), *Globestream* (digital cable), *Remote Satellite* (using Intelsat's Vista service for remote communities) and *Mobile Satellite* (using Inmarsat).

Teleglobe's current status and the prospect of liberalization means that it is now gearing up to compete with other well-established international carriers such as British Telecom, Cable & Wireless, AT&T, MCI and US Sprint for the Canadian international telecommunications business. Its business may soon be deregulated, which holds the prospect of continuing price reductions for customers and an ever-expanding range of new international service offerings.

At present, Teleglobe has no Vancouver Island customers on Globedirect or any other of its direct-to-the-customer services. One reason is that the benefits of being able to access its international switching centre are cancelled by the cost of the long distance backhaul to/from Burnaby. Thus, Vancouver Island customers are unlikely to participate unless Teleglobe, or another reseller, offers a "Teleport" service on Vancouver Island, allowing direct access to the international facilities at Lake Cowichan and Port Alberni.

3.2 Cellular and Mobile Radio Networks

BC has two cellular radio networks, both of which provide fairly extensive coverage to highway and marine areas in the Vancouver Island/Coast region. Both companies have their own digital microwave backbone networks which provide the trunking between cell sites and to/from the central switching facilities.

Customer growth on the cellular networks grew at 100% per year between the commencement of service in 1986 up until 1990, which caused the operators to successively accelerate their expansion investment plans. Over the past year, growth has slowed considerably as a result of the economic recession, however the business is still a fast moving one, with coverage areas expanding and the use of the network moving from purely voice and voice messaging to include data and FAX. The development of effective mobile data modems and FAX terminals using specially adapted error correction will accelerate these applications on the cellular networks.

The implementation of the new CT2 and CT3 standard wireless Personal Communication Networks (PCNs), and the licensing of organizations to offer these services competitively in the next year or so, will bring further competition for cellular operators. However, the next few years will also see a phased conversion from analogue to digital cellular transmission techniques. This will bring further impetus to the evolution of a fully mobile data/voice capability.

At the present time, the cost of air time, starting at $0.50 or $0.55 per minute (plus long distance costs at a 15% premium) deter many potential customers. However, the convenience, combined with competitive pricing packages and volume discount schemes, have rendered cellular service very cost-beneficial for many kinds of business user.

3.2.1 BC Cellular

BC Cellular is owned by BC Tel but operated as a completely independent company. It is interconnected with other Telecom Canada cellular networks and is part of the Canada-wide Cellnet.

BC Cellular's current coverage extends from Vancouver and Victoria (as far as Sooke) in the south of the region, northwards along the eastern coast of Vancouver Island and the Strait of Georgia to Campbell River. It also reaches to the north of Powell River in the mainland Coast area.

BC Cellular's expansion plans in the region, which are part of a $200 million province-wide investment program for the 1990-93 period, include the provision of full coverage along the Island highway from Campbell River north to Port Hardy.

The coverage westwards from the coast highway is, in most cases, only a few kilometres. Hence inland and west coast communities are not served.

The backhaul of circuits between cellular base stations and to/from the central switch in Vancouver is predominantly via a newly installed, BC Cellular owned, digital microwave network. Circuits are leased from BC Tel only to cover base stations which are not practically served directly by microwave. Most of the network has wideband (eg. DS3) capacity, but has been initially equipped to carry only BC Cellular's foreseeable traffic requirements. The microwave network is licensed only for internal use. Therefore, none of the spare bandwidth is available for re-sale to non-cellular users.

3.2.2 Cantel

Rogers Cantel Inc. is a wholly owned subsidiary of Rogers Communications Inc., which also owns a 40% stake in Unitel.

Cantel's cellular network and service coverage basically mirrors that of BC Cellular and costs are very similar. The BC network is interconnected with Cantel's nationwide network and offers full interconnect with the Telecom Canada telephone network.

As in the case of BC Cellular, Cantel has its own digital microwave facilities. Wherever feasible the Unitel network has been used for backhaul purposes. However, as indicated previously, Unitel's facilities north and west of the Vancouver Island - Campbell River corridor are limited. The details of Cantel's backbone network were not given to INTELECON because of the proprietary nature of the information.

Whereas Cantel's microwave systems are currently licensed to carry only backhaul traffic for the cellular radio network, the facilities form a major component in the Rogers-Unitel infrastructure. These may, in the future, be utilized to carry voice, data and video traffic for a number of competitive network service applications.

3.2.3 Autotel

Autotel is a province-wide, non-cellular mobile voice communication system provided by BC Tel along most of the main highways and along the BC coast. Because of its use of the 150 Mhz VHF frequency band and less sophisticated control system, extensive coverage can be provided much more economically than with cellular technology. It is also less expensive to use. The mobile equipment provides fully automatic service and the Autotel switches facilitate full roaming capability. Although Autotel does not allow a mobile to be "handed-off" between base stations during a call, as in the case of cellular, the much larger coverage area of each base station essentially obviates the need for this feature.

Because of the extended coverage provided by Autotel, it will continue to be the only province-wide mobile service available to remote communities in the Vancouver Island/Coast region for the foreseeable future. However, its usefulness will decline wherever cellular can provide users with the full coverage they need and where users can make use of cellular's increasing data transmission capabilities.

Autotel has competition from a range of independent *Radio Common Carriers*, who provide similar voice service to dedicated clients in specific areas, such as logging companies.

3.3 Satellite Networks

3.3.1 Telesat Canada

Telesat is Canada's satellite owner-operator and is owned by the Government of Canada (50%), the Telecom Canada companies (41%), Unitel (4%) and other carriers (5%). It leases its satellite infrastructure and/or provides services to the major carriers, as well as offering competitive services - either in the form of satellite transponder leases or complete systems including earth stations - to corporate users.

Telesat has well over 600 earth stations across Canada serving a wide range of customers. The most rapidly increasing private network application is the use of Very Small Aperture Terminals (VSATs), which can provide Time Division Multiple Access (TDMA) data or data/voice service to a large number of remote sites. One recent example is the provision of approximately 240 VSATs to every Chevron gas station in BC.

In the Vancouver Island/Coast region, Telesat has approximately five transmit/receive earth stations in addition to the Teleglobe stations at Lake Cowichan and the Chevron VSATs.

3.3.2 Canadian Satellite Communications (CANCOM)

CANCOM leases Telesat channels and provides two satellite based services to customers across Canada and BC. Its prime business area is in the distribution of television signals to over 1900 cable TV companies across the country. It is the main distributor in Canada for a package of eight TV programs, comprising four Canadian channels (including BCTV) and the four US stations from Detroit carrying the NBC, CBS, ABC and PBS networks. CANCOM is also an agent for CBC Newsworld and other channels.

CANCOM has proposed to launch and operate its own *lightsat* satellite in 1995 to distribute radio and TV signals across Canada. The Federal Government is currently considering CANCOM's application for a licence.

Within the Vancouver Island/Coast Region, at least 32 of the inventory localities subscribe to a minimum of one CANCOM channel, received either directly via satellite or via an associate terrestrial feed.

CANCOM's second business area is *Satlink*, which comprises a range of VSAT and mobile satellite services for businesses with multiple location communication requirements for video, voice and/or data, or mobile/transportable applications. The banking industry, wholesale distribution and large retail chains are potential users of the VSAT service. The trucking, rail and marine industries are users of the Mobile service.

At present there are only a very few Satlink VSAT or Mobile terminals in the Vancouver Island/Coast region.

3.3.3 Infosat Telecommunications Ltd.

Infosat is part of the Nexus Group of companies. It is essentially a manufacturer of satellite systems. However, like CANCOM, it provides satellite based voice, data and video communications systems for business and institutional users wishing to establish links between head office and remote locations. Infosat specialises in VSAT technology and has provided approximately 50 earth stations to various corporate customers across Canada, particularly in BC, Alberta and the Northwest Territories. Infosat primarily supplies, maintains and operates the earth stations and any associated terrestrial communications facilities. It also assists with the negotiation of the space segment (satellite service) from Telesat, or resells space segment at cost to facilitate network solutions.

In the Vancouver Island/Coast Region, Infosat has six earth stations located in: Saanich, Nanaimo, Campbell River, Moses Inlet and Jenny Inlet (logging camps) and one mining site in the Coast area.

Infosat has also provided a video uplink to the BC Buildings Corporation for BC Legislature proceedings. The company also has a contract to provide Knowledge Network's uplink from Burnaby for the next ten years, which is received throughout the region.

3.3.4 Other Satellite Services

This business sector can be expected to grow rapidly over the next five years, due largely to the cost-effectiveness of VSAT technology for companies with many and far-flung branches or agencies across the country. Several country-wide retail chains, including automobile dealerships, already have VSAT networks. For example, Scientific Atlanta has recently secured a license to operate a Canada-wide VSAT network from an uplink facility in Toronto. Its first large corporate customer will be Volkswagen.

The attractiveness of *datacasting* (point-to-multipoint one-way broadcasting of data) for some applications will lead to the implementation of networks having even larger numbers of low cost receive-only terminals across Canada, over the next three to five years. These systems will allow users to "piggyback" 56 kbps or higher speed data signals onto broadcast video channels, at low cost. This will open up new services which offer the wide-area distribution of databases, thus creating virtual interactivity without the need for dedicated two-way data circuits. It is expected that these specialist value added services will be offered by the broadcast industry.

3.4 Long-distance Resellers

Within guidelines set by the CRTC, several companies resell leased line facilities from Unitel and the Telecom Canada companies, offering dedicated and switched telecommunications services across Canada, and to the US and overseas destinations. They typically offer value added capabilities and services, particularly in the area of network management and specialised *Call Detail Account Recording.*

In all cases discounted long distance calling rates, through the use of US carrier routing, is one of the prime benefits offered to customers, although some stress the value added aspects of their service. The resellers generally have bulk leasing agreements with Unitel, particularly for the US bound circuits.

In BC, the leading resellers are:

- Call-Net Telecommunications Ltd.
- Lightel Inc. (Call-Net's major accounts division, which is also associated with BC Rail)
- Cam-Net Communications Inc.
- INS Incorporated (INSINC.)

Of these, Call-Net and INSINC. have established themselves on Vancouver Island, in the Victoria area only. Volume is not high and most of the Victoria business to date comes from companies headquartered elsewhere in Canada with branches in Victoria. None of the resellers currently have firm plans to expand in the region, though the results of the CRTC hearings on competitive long distance service could change the outlook for them.

3.5 Private Networks

Virtually all private networks in the province, with the exception of BC Hydro's and those based on satellite facilities, use infrastructure facilities leased from BC Tel and/or Unitel. However, the private network operator typically "adds value" to the leased facilities through the provision of specialised user oriented network management. Networks therefore usually include a considerable amount of privately owned multiplex, concentration, switching and data link protocol conversion equipment.

This inventory provides a brief overview of the major BC Government and quasi-Government networks in the Vancouver/Island Coast region.

3.5.1 BC Hydro

Although BC Hydro owns an extensive communications network in the province, providing telecontrol, data and voice communications for the purposes of controlling of its power network, the facilities in the Vancouver Island/Coast region are somewhat limited.

A 600 channel capacity analogue microwave system links the Vancouver Island regional headquarters, plus several power system installations in the Victoria area, with the provincial control and communications hub on Burnaby Mountain, via a repeater on Saltspring Island. The system extends northwards as far as the John Hart Generating Plant near Campbell River, and includes a substation in the Powell River area, via a repeater on Texada Island. Extensions to the network are carried by power line carrier, which serves the purposes of line protection well but has inferior voice and data transmission capabilities.

The three northern links will be replaced with digital microwave in the next 2/3 years. The southerly links will not be replaced as they were installed just five years ago. However, BC Hydro is looking at two alternative routes to Vancouver Island, to provide diversity for disaster recovery purposes.

BC Hydro's private switched telephone network comprises Northern Telecom SL1 and Mitel SX-200 PABXs at all key offices. T1 supergroup modems (on the analogue microwave system) currently provide digital voice/data PABX trunking and 56 kbps data links between Victoria and Nanaimo. Smaller offices are not necessarily part of the BC Hydro communications network but are served by BC Tel.

The data transmission speeds between Vancouver, Victoria and Nanaimo will increase significantly over the next few years, as Geographical Information Systems (GIS) are introduced.

The data processing needs of BC Hydro's administrative offices are handled by its corporate subsidiary, Western Integrated Technologies. Data circuits are provided on BC Hydro's private network where available, or via BC Tel leased data lines.

3.5.2 BC Systems Corporation

BC Systems Corporation (BCSC) is headquartered in Victoria and is mandated to provide its shared-usage communications network facilities to Provincial Government Ministries and Crown Corporations throughout the province. Its corporate charter specifically bars it from providing network facilities to private sector commercial organizations, although it does support value added services - particularly information access and transactional

services - which are used by the private sector (See Section 2.6). It is also able (and actively seeking opportunities) to cooperate with the private sector in projects which promote provincial development and commercial interests. The dividing line between government and private sector usage of the BCSC network will be increasingly difficult to maintain if BCSC's involvement in multi-user and value added networks grows.

BCSC operates three province-wide networks, namely DNET, SNA Net and PROVNET. All of the basic infrastructure is leased from BC Tel, Unitel and BC Rail. BCSC provides most of the switches, concentrators, terminal interfaces, modems and network management for its data networks. The majority of the PROVNET voice network switches are still leased from and maintained by BC Tel.

Whereas the ownership of BCSC's data network systems and the network management was initially shared with the carriers, BCSC has progressively taken control of its own networks over the past few years. It therefore provides a full carrier service to its clients and offers specially developed usage-independent pricing structures. BCSC operates commercially, at a profit, and is now returning dividends to its shareholder, the Provincial Government.

BCSC's services in the Victoria area were, until recently, delivered over a series of BC Tel leased "copper star" cable facilities. These still carry 95% of the data networks' city traffic at speeds of up to 56 kbps. However, in the fall of 1990 the Corporation implemented a 100 Mbps optical fibre system (leased from BC Tel), which operates on a Fibre Distributed Data Interface (FDDI) network protocol. This *Metropolitan Area Network (MAN)* provides high speed (4Mbps) access to DNET and SNA Net for BCSC's customers. It is currently fully operational for four customers (Land Titles, Forests, Health, and Finance and Corporate Relations) which have high speed applications. The MAN will eventually serve over 20 government buildings in Victoria.

80% of BCSC's total lease expenditures are from BC Tel, in view of its regulated monopoly over the local loop. However, 45% of the long distance data transmission purchases are contracted with Unitel.

Because of its position as the Government's telecommunications service provider and primary source of expertise in the information technology and data processing arenas, BCSC is in the forefront of innovation in a number of areas such as electronic imaging, data processing, Electronic Data Interchange (EDI), information storage and retrieval, and resource oriented Geographical Information Systems (GIS). Specific initiatives and future developments are discussed elsewhere in the report.

The following describes the features and regional coverage of BCSC's networks, which are illustrated in Appendix B2:

Distributed Network (DNET)

DNET is an X.25 packet switched data network similar to BC Tel's Datapac and Unitel's FasPac. The primary difference is that the service pricing structure is non usage dependent, in order to meet the needs of Government's regular budgeting.

The network services 1,000 BC Government office locations having computer hosts, terminals, PCs, FAXs, LANs and Ethernets. Approximately 70 minicomputer hosts are on the network and up to 10,000 devices in total. All network systems - concentrators, Packet Assembler/Disassemblers (PADs), Routers (for Ethernet interface) and modems - are owned by BCSC.

In the Vancouver Island/Coast Region, there are main *Switching Nodes* in Victoria and Nanaimo. These are currently interconnected with 128 kbps transmission links and in turn link to *Service Nodes* in Duncan, Port Alberni, Courtenay, Campbell River and Powell River at 19.2 kbps.

Throughout the region there are at least 283 office connections to the network. 236 of these are in Victoria. Only 14 locations were identified in the inventory, although some terminations from Service Nodes may be destined for locations further afield than indicated. The most northerly termination is in Port McNeil. The transmission speed of the individual line terminations are summarised as follows:

Speed, kbps	% of total
9.6	11
19.2	78
56.0	11

The transmission speeds between nodes are increased by BCSC as traffic on the network warrants. For reasons of price and economy BCSC does not over-provision and network upgrades can be achieved with 3-4 months notice. The prime indicator of network load/overload is *response time.* BCSC's current network response time objective is 100 msec for 95% of all terminal connections province-wide. However, response time increases with distance and the number of network nodes, hence the most distant end-points are usually below the target value. BCSC improved its response time in 1990/91, following a survey which indicated some user dissatisfaction with the network's performance.

The price of the network to the user, as already noted, is non usage sensitive. Users pay a one-time access fee plus a flat monthly charge based on the transmission speed and location. The monthly fee increases with a combination of the network distance from Victoria and the incremental

network costs. The rates are indicated below for synchronous 19.2 kbps access:

Location	Cost ($)
Victoria	1040
Nanaimo	1329
Duncan	1855
Port Alberni	1855
Campbell River	1855
Ucluelet	2642
Gold River	2642
Port Hardy	2975
Parksville	2977
Powell River	3031

SNA Net

This network is based on the IBM Systems Network Architecture (SNA) and connects 20 hosts and approximately 17,000 terminals in over 100 localities throughout the province. The network comprises nine interconnected Regional Network Centres (RNCs), including Victoria, and a larger number of Secondary Network Centres (SNCs) which support user access at 9.6 kbps or 19.2 kbps and ASCII to 3270 compatible SDLC datastream protocol conversion. In the Vancouver Island/Coast Region, Duncan, Nanaimo, Port Alberni, Courtenay and Campbell River are SNCs. There are also Tertiary Network Centres (TNCs), which provide 9.6 kbps access, at Port Hardy and Powell River.

A total of 350 individual office connections are made to the network in the region, with 283 of these in Victoria. The network extends to more localities than DNET, with 19 identified in the survey. The transmission speeds of the user connections are summarised as follows:

Speed, kbps	% of total
9.6	42
19.2	28
56.0	30

User access is priced according to location and network specific terminal requirements. The location specific component increases with distance from Victoria and the ratios are larger than with DNET.

PROVNET

PROVNET is a switched voice network with advanced digital switching and transmission facilities. It has approximately 40,000 subscribers province-wide, connecting all Government offices. Two large, BC Tel provided Centrex exchanges, located in Vancouver and Victoria carry most of the load. There are PABXs in most other centres.

There are over 12,500 centrex lines in Victoria and Nanaimo. Elsewhere in the region, major PABXs are located in Victoria, Duncan, Nanaimo, Port Alberni, Courtenay, Campbell River and Powell River, with BC Tel provided tie trunks from these to other centres. Throughout the Vancouver Island/Coast region, a total of 2,500 tie trunks or subscriber lines serve smaller PABXs, key telephone systems and subscriber groups in 45 localities in the region.

The PROVNET service is priced on a flat rate basis, at $100 monthly to subscribers anywhere in the province, with free network-wide calling.

Future Plans

In 1992, BCSC will provide connections to both the DNET and SNA networks at up to 512 kbps, wherever required, for applications such as Ethernet and LAN interconnections. The government is currently considering a BCSC proposal for a major investment in the network to provide an integrated broadband "electronic highway" backbone to all major traffic points in the province.

Because of the digital switching and trunking facilities on PROVNET, and the variable nature of voice telephone traffic, BCSC is able to use PROVNET for data transmission, at speeds of 64 kbps and above, in the non-busy hours. It is currently looking at using the network for high speed (384 kbps) image transfer applications. This form of voice/data integration is the first step in the long term plan for an integrated single network. There is no firm date on eventual total network integration, which should not therefore, at this stage, be seen as a definite path for the immediate future.

3.5.3 Insurance Corporation of BC (ICBC)

ICBC operates a province-wide SNA based data network, using BC Tel, Unitel and BC Rail leased circuits. The network includes eight interconnected network nodes. Two of these, in Victoria and Nanaimo, have separate connections to the mainland via 56 kbps links. Victoria and Nanaimo are interconnected at 19.2 kbps. The network also has interconnection to three external networks, namely BCSC's SNA Net, IBM

and ADP. Future plans include the addition of gateways to international standard networks such as X.400 and Electronic data Interchange (EDI).

ICBC's host computer is at the headquarters building in North Vancouver and the network provides access to a range of remote terminals, workstations and printers located in claims centres and agency offices. Network access for ICBC claim centres and agencies is at 19.2 kbps and is currently available in 14 localities in the Vancouver Island/Coast Region.

ICBC also has a voice network which includes main PABXs at the headquarters and major claim centres, plus smaller PABXs and electronic key telephone systems at every claims office. ICBC makes major use of Automatic Call Distribution (ACD) as an important feature in its service to the public.

In addition to the limited use of inter-office tie lines, ICBC uses numerous 1-800, WATS, Foreign Exchange and Central Office services from BC Tel. ICBC does not currently use private leased line service for voice applications and a recent pilot evaluation concluded that a dedicated voice network would not be cost justified.

3.5.4 BC Lottery Corporation

BC Lotteries has a wide area data network connecting 2,150 terminals to its host computer at the Kamloops head office. Approximately 20% these are located in the Vancouver Island/Coast region and are in a wide variety of premises, such as shopping malls, corner stores, bars or other private sector locations. All terminals operate at 1200 bps. Network nodes exist in Victoria, Duncan, Nanaimo and Campbell River. These have connections to Kamloops, via Vancouver, at 19.2 kbps. The Crown Corporation does not plan to upgrade its network data speeds in the near future.

3.5.5 BCnet

BCnet is a data communications network linking over 40 establishments in the Lower Mainland, Greater Victoria, Nanaimo and Kelowna. The network is owned cooperatively by its members, who are organizations and institutions in education, research & development, and the information technology industry. The network supports activities in all of these sectors but currently does not allow the use of the network for commercial (fee generating) services.

BCnet provides LAN interconnection and access to research and education communities throughout BC, Canada, the US and to 28 other countries by means of the CA*net links to the NSFNET. The services available include

remote terminal access, network news, file transfer, electronic mail, and free access to a wide range of archive material.

A network layout diagram is included in Appendix B2. The network's hub is located at SFU HC, the Harbour Centre Campus of Simon Fraser University. One of the network's primary links, between UBC and SFU Burnaby, was formerly coaxial cable, leased from Rogers Cable. Now the network uses BC Tel leased lines to provide the following interconnections:

- SFU Burnaby and UBC have 1.5 Mbps links to SFU HC; UVic has a 224 kbps link to SFU HC; and TRIUMF is connected to UBC at 2 Mbps. All of these links use MAC-level bridges to carry all Ethernet-based protocols between the Ethernets at these institutions.

- The remaining BCnet members are connected with routed links which carry only TCP/IP, the Internet protocol. They include schools, colleges, and R&D and industrial users, all using lower-speed links (2.4, 9.6, 19.2 and 56 kbps) to connect to one of the four university campuses. Some use standard asynchronous modems over leased or dial-up lines, achieving full-function Internet connectivity using the SLIP or PPP link-level protocols.

- SFU HC is directly connected to three CA*net links, a 56 kbps link to Toronto, a 56 kbps link to Edmonton, and a 112 kbps link to Seattle, CA*net's western point of contact with the NSFNET, the backbone network of the Internet in the United States.

A link to Kelowna was established in April 1991, over BCSC's DNET X.25 network.

The current members of BCnet include eleven universities and colleges, five research labs, two non-profit foundations, BC Systems Corporation, and seventeen industrial companies.

There are a total of eleven Vancouver Island based members. The following ten members are based in the Victoria area:

■ University of Victoria	224.0 kbps
■ Camosun College	9.6 kbps
■ Royal Roads Military College	9.6 kbps
■ Education Technology Centre	19.2 kbps
■ Dominion Astrophysical Observatory	56.0 kbps
■ Institute of Ocean Sciences	56.0 kbps
■ Pacific Forestry Centre	9.6 kbps
■ BC Systems Corporation	19.2 kbps
■ Softwords Ltd.	9.6 kbps
■ MYRA Systems	9.6 kbps

The remaining member on Vancouver Island is Malaspina College in Nanaimo.

BCnet is planning to expand its coverage in BC in the next one to two years. A further 16 organizations are planning to become members. BCnet is also working with the Educational Technology Centre, BC Systems Corporation and BC Tel to develop a province-wide schools access program. A pilot project is currently underway in the Southern Interior region. If implemented, this would ultimately provide connection to all of the schools in the Vancouver Island/Coast region, however the time scale for complete implementation may be up to four years.

Network Costs

BCnet members pay all the initial and ongoing hardware, software and data line costs of connection to the network, and in addition pay monthly dues which are independent of usage and based on the speed of the link to BCnet, as follows:

2.4 kbps	$40
9.6 kbps	$161
19.2 kbps	$321
56.0 kbps	$938
224.0 kbps	$3750
1.5 Mbps	$3750

The current stipulation that the maximum annual levy should be $45,000 means that a T1 connection would cost no more than 224 kbps. The above pricing structure includes a 50% rate increase which was enacted in 1991. However, this does not provide sufficient cash injection for the network to expand significantly. Because of BCnet's low overheads and non-profit status, network fees are still relatively low. In the event that transmission speeds were greatly increased to accommodate imaging and other high speed applications, fees would need to be significantly increased again. In addition, the provision of a government injection to encourage the network's development may be justified. This is discussed further elsewhere in the report. However, allowing the use of the network for commercial traffic is also under consideration and this policy could, if priced competitively, help to generate additional revenues for expansion.

3.6 Value Added Networks

Three non-BC Tel Value Added Networks (VANs) which are particularly important examples of Government-Private Sector cooperation in the development of information technology are included in the inventory. All

three of these special interest network services use the BCSC network infrastructure.

3.6.1 BC OnLine

BC OnLine is operated by BC Systems Corporation. The service offers users self-serve access to Registry information in the databases of the BC Government's Land Titles, Companies and Personal Property registries, via dial-up to the BC Systems Corporation network. The number of users has grown from just over 2,000 in mid 1989 to 12,000 currently. They include legal firms, banks and financial houses, real estate agencies, automotive dealers and general business.

Search fees, which are fixed at slightly less than a search done in the Registry office, are charged directly to the BC OnLine user's account. A recent agreement with one of the major banks will also allow direct electronic funds transfer to pay user accounts.

3.6.2 BC Business Network (BCBN)

The BCBN is an electronic marketplace that aims to link producers to markets, entrepreneurs to investments, and vendors to customers.

The service is operated by the BC Trade Development Corporation and provides, via a single dial-up to BC Trade's computer (on Datapac), access to 26 different information providers in BC, Canada, the US and elsewhere. These include databases from four BC Government Ministries, the Federal Government, US Department of Commerce, and the World Bank. The service includes databases on:

- Recent News (eg. Tax and GST rules, etc)
- Business Information Resources
- Facts & Figures (eg. BC Statistics, Import/Export, Country profiles, Small business financial profiles, etc)
- Business Opportunities (eg. Provincial & Federal tenders, Investment opportunities, market place listings, USA and International trade & tender leads, etc.)
- Companies information (company locations, Industry sectors, Products & service notices, etc.)
- VentureNet (focusing on the matching of investors with opportunities)

The BCBN has not been as popular or successful as BC OnLine, due mainly to a combination of user difficulties (not "user friendly" enough) and relevance of the data (not specific enough for many businesses). The

management of BCBN is continually trying to improve the service, to make it more useful. For example, effective 1st November 1991 the service now includes:

- Business to Business notice board, which allows users to post sales leads, price deals and product requirements or announcements
- BC Manufacturers Directory, containing information on 7,800 BC based firms
- Mail label system, initially associated with the Manufacturers Directory (the previous system worked unsatisfactorily)
- Event Line, which will list more than 47,000 conferences, symposia, workshops, etc. world-wide (from January 1992).

A key improvement has also been the issuing of a new manual and provision of free network user training sessions.

Users pay a $75 sign-up fee for the BCBN service, plus $0.50 per minute usage charge. Certain of the services in the package also carry a further fee or usage surcharge. There are currently 3,000 subscribers to the service, including 1,600 non-government users, and 300 private sector users in the Vancouver Island/Coast region.

3.6.3 Teleplan II

Teleplan II is an EDI based service for the electronic submission of physicians' claims to the Medical Services Plan (MSP) of the BC Ministry of Health. Physicians are able to check eligibility of individual patients on-line to the MSP computer in Victoria (or for batches of patients with an overnight turn-around). Medical office assistants usually enter the payment claims into office PCs and submit them after closing. 50% of all claims are actually submitted by way of MSP service agencies.

The network uses an MS-DOS based SIMWARE software package. Access to the MSP host is via dial-up to BCSC's DNET X.25 network. The access is toll-free for all centres in the province with a population of 4,000 or more.

Teleplan was implemented by the Ministry of Health with the objective of reducing administrative costs and improving efficiency. It achieved the Government cost reduction objective of freeing 117 full time equivalent (FTE) data entry clerks. It also speeded claims processing for physicians as well as saving losses from patient ineligibility, and provides some additional administrative benefits.

The method of implementation was to impose the system on physicians, with minimal prior consultation or marketing. Consequently, although the implementation time was relatively quick, the response was not always positive at first. However, the system is now recognized to have been effective.

Future improvements, such as expansion of the toll-free access privileges to smaller localities, would be desirable. Also, the infrastructure created by Teleplan provides an opportunity to share other information electronically. One such expansion, which is currently at the pilot stage, involves the addition of an electronic mail service (DOCS). This would facilitate messaging between physicians, hospitals and laboratories. The system includes the transmission of pre-admission and booking data and lab results to/from hospitals, as well as access to clinical databases such as Micromedex. Initial reaction indicates that DOCS will only be successful if a higher degree of user-friendliness can be achieved.

3.7 CATV Networks & Systems

Community Antenna TV (CATV) systems now provide multi-channel TV service to the vast majority of homes in BC. The cable TV industry is regulated Federally by the CRTC. In the Vancouver Island/Coast Region there are a total of 25 CATV companies providing service to both large areas and small communities. 44 of the localities in the inventory are served by cable TV. A further 9 are served by community owned cable or low power TV re-broadcast systems paid for under the BC Government's Communications Grants program.

Rogers Cable is the largest cable company in the province, providing service to 550,000 homes, or 55% of the market. Shaw Cable has 25% of the market. The remainder have 20% together.

The primary CATV distribution network in the province emanates from the 4 West Microwave Consortium, of which Rogers Cable is the leading member. The consortium operates a major hub in Burnaby, where signals are collected from seven head-end locations in Canada and distributed to all of the cable companies in the Lower Mainland, with an interconnection to Saltspring Island and from there to Vancouver Island. Two of the main links in the network - from Burnaby to Grant Hill in the Fraser Valley and from Burnaby to Cloverdale - are to be upgraded to optical fibre in the 1992/93 time frame. This is judged by the industry to be necessary for quality improvement purposes, in order to compete effectively with direct satellite reception and home video entertainment.

As already noted, a number of channels are distributed via satellite direct to remote CATV companies by CANCOM, while many small community CATV

companies and societies are receiving Knowledge Network programming via satellite, under the PEETS Grant program.

All CATV networks currently use coaxial cable for distribution to homes. Whereas optical fibres are being installed between major hubs to increase total capacity and quality, the cost of a widespread conversion of the distribution networks would be too great to attempt in the near term. The major companies are currently carrying out research to improve the picture quality of their signals. At present, it is expected that the most cost-effective means to achieve this end will be to use digital noise reduction techniques rather than the much talked-about wideband High Definition TV alternative.

Datacommunication Service Possibilities

CATV distribution networks are configured in a "tree and branch" architecture. As such, they are capable only of one-way transmission. It is not expected, therefore, that CATV companies will be able to offer duplex telecommunications delivery in the immediate future. Techniques have been developed to allow both telecommunications and broadcast services to be offered over tree and branch optical networks, which allow 30-50% cost reduction over the traditional "switched star" architecture required for duplex services. This will eventually lay the groundwork for the convergence of telecommunications and broadcasting technology. However, regulatory issues would also need to be addressed before the CATV and telephone company engage in direct competition for the range of multi-media datacommunication services which may be feasible to the home by the end of the decade. Rogers Cable and IBM have recently joined forces to explore the possibilities of providing wideband multimedia services in the future.

In the meantime, we may expect to see television signals increasingly used to distributed one-way or quasi-interactive data in the bulk *datacasting* or *teletext* mode. This technique allows the "piggy-backing" of data signals of at least 56 kbps onto the main video signal, by use of the vertical blanking intervals in the video signal. It could be useful, for example, in association with educational TV (eg. Knowledge Network) to enhance the value and interactive nature of TV transmission. Alternatively, it could be used to offer new kinds of quasi-interactive network services to the home or to small businesses.

3.7.1 Saltspring Island Microwave Association

The Saltspring Island Microwave Association is a non-profit organization, jointly owned by participating cable TV companies. The Association operates a system of community antennas receiving US programs off-air (on Saltspring Island), and an analogue microwave network extending from Saltspring Island:

- to/from Rogers Cable in Victoria (this link is owned and maintained by Rogers Cable on behalf of the Saltspring Island group).

- from Rogers Cable to Shaw cable in Victoria (jointly owned and maintained by Rogers and Shaw).

- backbone and spurs to Duncan, Nanaimo, Parksville, Port Alberni, Courtenay, Campbell River and Powell River, to serve the cable companies in these localities.

The participating cable companies pay for the channels they receive via the microwave network on a pro rate basis according to their cable subscriber base.

3.7.2 CATV Companies

The following provides an overview of the Cable TV companies operating in the region:

- Rogers Cable

  Rogers Cable TV provides cable TV service to two thirds of the homes in the Victoria area.

- Shaw Cable

  Shaw covers the remaining one third of the Victoria area and also serves the Duncan, Nanaimo, Port Alberni and Parksville areas.

- Comox Valley Cablenet

  Comox Valley Cablenet serves approximately 20,000 subscribers in the Courtenay, Comox and Powell River areas.

- Campbell River TV Association

  The Campbell River TV Association is a cooperative owned by its members and serves 11,500 subscribers in the vicinity of Campbell River.

- Miscellaneous local systems

  The remainder of the region includes 21 TV companies and associations, providing service to 13,000 subscribers in 34 communities.

3.7.3 Communications Grants Recipients

The Ministry of Development, Trade and Tourism's listing of Communications Grants recipients has been used to provide an indication of the coverage of the Knowledge Network in the region. A total of 18 communities have received grants for Knowledge Network programming. Thus, allowing for some overlap as indicated in the *Facilities and Services Database* and assuming all other Cable TV companies also distribute KNET, the survey indicates that KNET is received in at least 53 of the 79 localities covered in the inventory.

4.0 INTRODUCTION

4.1 General

In this phase of the study, INTELECON carried out research into:

- the current and future need for telecommunications infrastructure services in key development sectors,
- the knowledge of currently available services among users and potential users in these sectors,
- their appreciation for the current and potential role of telecommunications in their business, and
- the future demand for advanced telecommunications services.

The objective was to describe the user environment, sector by sector, and to highlight the key issues regarding availability of telecommunications services, with reference to the regional development objective of encouraging the growth of a strong and competitive information industry.

This exercise was carried out in parallel with the *Overview of Strategic Initiatives in Other Jurisdictions*, which considered the specific relevance of each of the initiatives identified to the British Columbia environment. The development of demand for advanced telecommunications services in these jurisdictions was also looked at, where information was available. Thus by considering the linkages and similarities which exist between the B.C. economy (and organizations based in the Vancouver island/Coast region) and other jurisdictions, some tentative demand scenarios can be derived and potential strategic initiatives for the region developed.

An overview of the user survey is provided herein, from both the sectoral usage and technological (application) perspectives. Initiatives currently underway, planned or under consideration are also presented briefly within the reports of individual sectors.

4.2 Survey Focus

The initial focus for the survey was the "high technology community", represented by organizations who have membership or have shown interest in the Vancouver Island Advanced Technology Centre (VIATC), plus similar or associated organizations in the Coast sub-region.

This horizon was ultimately expanded to included a sample of all companies and organizations who might determine or influence telecommunications demand. Whereas a significant number of VIATC members have little or no special telecommunications requirements, *there are many non-members, particularly in the service sector*, who are driving the demand for advanced telecommunications services.

Approximately 80 individuals were interviewed, representing companies or organizations in the following ten economic sectors:

Sector	No. Interviews
Education	6
Advanced & Continuing Education	11
Research	7
Manufacturing & other industries	13
Resources & mapping	6
Health & Medicine	6
Government Services	7
Libraries	9
Tourism	10
Financial & Other Services	9

A complete listing of the interviewees is provided in Appendix C1.

The range and number of interviews carried out was considerably more than initially envisaged. Once the research had begun, it was quickly recognised that a realistic picture could not be obtained without a fairly broad sample. With information technology moving so rapidly, current use of telecommunications may reveal only a small fraction of the market which could exist in just two or three years.

In this environment, some organizations as yet show little appreciation for the potential use of new services, beyond the telephone and fax. Others (still relatively few) are experimenting with data communications and brimming with plans or ideas for new applications, whilst a third category - mostly small businesses - display indifference or incomprehension at first *but after a few minutes of discussion reveal a marked interest for a specific or relevant application.*

As a result of the range of responses (even amongst high technology firms), several organizations in each business sector had to be interviewed before a clear picture of the potential demand emerged.

4.3 Survey Methodology

The aim of the survey was to identify and gain an appreciation for the following, from each organization interviewed:

- What business activities are carried out and what are the telecommunications needs and network services currently utilised?
- How typical is this pattern within the user's particular sector?
- Does the organization (and sector participants generally) have an appreciation for the role or potential role of telecommunications in its business area?
- Does the current availability, quality or cost of specific telecommunications facilities or services have a bearing on business decisions or performance?
- Does the organization know about current developments in information technology and telecommunications which might affect competitive performance, and does it have a desire to be in the forefront?
- What plans or projects does the organization have which will require additional telecommunications facilities or services?
- What specific telecommunications policy initiatives from Government or the telecommunications industry would make a difference in the organization's usage pattern and/or business performance?

The majority of the interviews were by telephone. Approximately twenty were undertaken face-to-face in the Victoria and Comox/Courtenay areas. In a number of sectors, such as Education, Advanced Education, Government Services, Health and Resources (Mapping), recent reports or articles were obtained which provide valuable and up-to-date information on the use of telecommunications technology and future plans. This reduced the number of interviews required in these sectors. The most significant resources of this kind are listed in Appendix C2.

A basic questionnaire, the short form of which is attached in Appendix C3, was used to help structure the interviews. However, as indicated above, this was frequently a starting point only. Sufficient time was given in each interview to investigate a whole range of issues, ideas and initiatives.

The approach adopted in each interview was also adjusted from case to case, depending on whether the subject was a senior civil servant responsible for setting Government strategy, a business executive/owner, or a data processing or telecommunications professional. In each case,

however, the following specific telecommunications applications were discussed, as appropriate:

- E-Mail & bulletin boards
- Access to databases, market data, etc.
- Electronic transactions & EDI
- Image transmission
- Colour CAD/CAM
- Teleconferencing
- Video conferencing

Because of the flexible approach adopted in the interviews and because of the variety of source data, our survey report is structured to highlight the service and sectoral trends, and the demand and development issues identified, rather than to give a statistical summary of responses to specific questions.

5.0 SECTOR OVERVIEW

5.1 BC Government

As a market for telecommunications infrastructure facilities and advanced information technology services, the Vancouver Island/Coast Region is currently dominated by the needs of Government and Crown Corporation users. These users are, on the whole, relatively well attuned to the potential use of telecommunications in their respective business areas. *As users of the BC Systems Corporation networks and having access to the BCSC expertise, they are generally well informed on the possibilities for further development.* As a result, the Government is likely to remain the market leader well into the future.

By contrast, sectors not served by BCSC - notably the advanced educational institutions and the private sector - are not as well endowed as they might be. In particular, some institutions and businesses outside of the main centres are somewhat constrained by the quality and cost of the telecommunications services available to them.

The BCSC DNET and SNA networks support many internal Ministry dataprocessing applications. These are growing at a high annual rate, typically in the 15-30% range. In addition, the Government has, over the past 2-3 years, developed applications for public access to Government databases and documentation and these will increase rapidly over the next few years. The expansions will most likely include:

- BC OnLine (further growth and enhancement, including document imaging)
- BC Business Network (to be improved and enhanced)
- Electronic Mail (development of an OSI compatible, X.400 system
- An electronic version of the B.C. Government Directory
- Purchasing Commission information and transactions (Bulletin boards, EDI and EFT)
- Health Networks (expansion of the MSP Teleplan network to include physician-hospital communication and on-line Pharmacare)
- Geographic Information Systems (a common standard used by several Ministries will eventually facilitate inter-Ministry networking and access to a wide range of specialised mapping data through common regional directories)

Based on current policy and strategies, it appears that all of the above, although allowing *access* by non-government users, will be supported almost entirely by the BCSC network, except that dial-up access lines will be via the public network.

The most significant sectors of the telecommunications market which lie outside or partially outside of the BCSC's responsibility are summarised in the following sections.

5.2 Advanced and Continuing Education

UVic is a major BCnet subscriber and potential market leader. Its 224 kbps link to UBC and TRIUMF supports also the nine other BCnet users in the Victoria area. This link appears to provide an adequate response time and throughput for the existing data traffic, but would be inadequate for the range of user applications, including interactive graphics and video conferencing, which UVic's scientists and engineers envisage using the link for. At present these applications would be constrained by the low capacity of the link.

Upgrading of the UVic-UBC link to T1 is already considered by some to be overdue. However, BCnet has been unable to justify expansion economically without a proven demand. A recent increase in user fees has allowed BCnet to commit to the upgrade for April 1992. As is true of all data links in BCnet, though, this link will be a single packet-switched pipe without multiplexers. Using these links for voice or video will have to await router and interface developments currently undergoing trials and further research, which will allow the transmission of these applications over a packet-switched link.

With increasing LAN speeds and a desire to interconnect transparently with the UBC and SFU networks, further expansion beyond T1 capacity will be desirable in the foreseeable future, although the actual requirement is hard to predict at this point.

UVic has the potential to augment the international competitiveness of local R&D and manufacturing firms, eg. through providing networked access to advanced CAD/CAM systems, library facilities, ongoing education, etc. These types of arrangements have been significant success factors in the USA, eg. Stanford University has been able to provide technical services and advanced courses for scientists and engineers, over a range of telecommunications and media networks, to the high technology firms of Silicon Valley. *Without the strategic implementation of network services, synergies between the academic and industrial community on Vancouver Island are unlikely to occur.* This is primarily because of the size and limited financial resources of most of Vancouver Island's firms (see 2.6, *High Technology Companies* below).

UVic is a significant player, through its Health Information Sciences Department, in the various telecommunications activities involving the Health sector (see 2.3, *Health* below). It also has important linkages to telecommunications applications initiatives in virtually every other sector.

The colleges - Camosun, Malaspina and North Island - have BCnet and/or other network service connections and will be increasing their use of distance education technology in areas such as Health (eg. nurse training) and job retraining. Both Malaspina and North Island College have multiple campuses and/or regional centres. The cost of network facilities currently hinders their experimentation with more innovative outreach strategies which would make higher education and retraining cost-effectively available to more communities.

The Open Learning Agency will be a growing network user in the future, particularly in the promotion of multi-media learning centres and as the agency responsible for delivery of satellite based education and training programs. It currently has a multi-media ISDN demonstration project in process in Greater Vancouver. This could lead to the implementation of up to 12 learning centres in the Vancouver Island/Coast Region over the next five years.

All of these organizations are well attuned to the potential application of telecommunications. Moreover, as Internet and CAnet are transformed to higher capacities, the improved capabilities of these networks will not be available to Vancouver Island users unless the Vancouver-Victoria link is upgraded and local access also improves. The primary impediment to more use of network technology is generally the cost of the facilities and services. For this reason, expansion of the shared user BCnet is looked to as the most cost-effective way forward.

Every effort needs to be made to ensure that there are no bottlenecks for Vancouver Island users. This might entail, for example, consideration of a direct Victoria-Seattle link into the NSFnet as an alternative to the CAnet link (and as a secondary route for other BC users).

5.3 Health

At least fourteen information technology projects are currently active in the BC Health sector. These include local database trials, the EDI based province-wide Teleplan II physician billing system, and a BC Tel sponsored optical fibre digital technology trial involving the Greater Victoria Hospital Association (GVHA) and UVic. This project includes video conference teaching (between UVic and the two Victoria hospitals), remote viewing of microscope specimens, scan image viewing and other high speed laboratory data applications. There is a certain amount of development required yet, before the transmission of high resolution scan images between sites becomes a routine part of clinical work. However, the GVHA trial is proving the application for medical networks with multiple T1 capacities at least.

The hospitals in Nanaimo, Courtenay and Campbell River would also have potential T1 or sub-T1 network applications to Victoria, given the availability of reasonable cost facilities.

In general, hospitals are moving towards the establishment of TCP/IP based local area networks. With Vancouver General and Shaughnessy having already moved in that direction, the possibility of cost-effective networking between the Lower Mainland and Vancouver Island hospitals via BCnet also exists.

A proposed occupational telehealth trial involving the remote transmission of X-ray images could, if successful, demonstrate the need for and the benefit/cost relationship associated with network connections to remoter locations at data rates of up to 56 or 64 kbps, within the next few years.

At lower speeds, there will be demand for e-mail, EDI and bulletin board systems to serve between physicians, hospitals, pharmacies, laboratories and public health professionals, once the required level of user-friendliness can be developed.

5.4 Forest Resource Companies

MacMillan Bloedel, Canadian Forest Products and Fletcher Challenge each have extensive private voice and data networks. *Typically, up to 12 locations in the region are networked together and to the mainland at data rates ranging up to T1.*

The impetus for increased use of advanced telecommunications by the forest industry, including video conferencing between the main centres and Divisional offices is strong. It is limited primarily by availability and cost of the carrier facilities to the more remote divisional office locations. The use of networking for electronic Graphical Information Systems (GIS) map file transfers is not imminent but can be expected in the 1993/94 time frame.

5.5 High Technology Companies

Vancouver Island's electronics and software development firms range in size from 2 or 3 people to 40 people. Although many firms have in-house networks, their use of telecommunications carrier facilities or network services is very limited. A small handful of firms have private lines or BCnet lines, while a few subscribe to Datapac service. The remainder utilise the dial-up voice network for transferring files to/from suppliers, clients and marketing representatives as and when required.

A growing number of firms are developing international markets. In most cases, communication with US and overseas marketing representatives and clients is by fax. A well-organised in-house client database, plus broadcast fax services are the important tools for this type of application, although a few firms use e-mail. One or two others, who are not current users, expressed an interest in e-mail.

As noted in Section 2.2 above, *it is believed that the viability of many of Vancouver Island's high technology companies may be severely limited by their relative isolation from network based facilities.* Small sized firms often flourish for a few years on the skills of one or two key individuals. However, a lack of connectivity with other leaders in their respective fields can prove to be a severe handicap. Whereas several firms have successfully transformed themselves into larger organizations, there is an established pattern that many of the smaller firms disappear from the scene.

By contrast, some BCnet users in Vancouver, who are in similar business areas, find facilities such as network news, database retrieval and file transfer (eg. public domain software) to be invaluable. They expressed the view that Vancouver Island based firms must also learn to make use of them if they are to stay current, maintain their competitive edge and grow.

There is not yet a high level of appreciation or enthusiasm in this sector for how networking might improve business opportunities. Because of their small size, many firms are unwilling or unable to justify the time or costs for acquiring and learning to use new network services. Likewise, the use of quality-enhancing technology such as CAD systems, or ongoing education courses do not have a high level of interest, even though these facilities might be available from UVic. *The provision of reasonable cost network facilities - eg. dial-up access to BCnet - combined with an awareness program on how international competitors are making use of technology and continuing education, could prove to be an important factor in the survival and growth of small high tech companies.*

A few firms, especially those which are part of an association or group (eg. the subsea community) did express a stronger interest in networking, including bulletin boards, teleconferencing or video conferencing (if the costs were attractive relative to travel). The demand for such services could thus increase significantly over the next few years if they are marketed wisely and aggressively.

5.6 Research Institutions

Three federally funded research institutions in the region - the Dominion Astrophysical Observatory, the Pacific Forestry Centre and the Ocean Sciences Institute - are all members of BCnet with 56 kbps access

connections. All are relatively heavy telecommunications users and their requirement for higher bandwidth facilities, for applications such as electronic mapping and (in the case of the DAO) for very large research file transfer to/from the USA and international destinations, will increase significantly. A fourth institution, the Herzberg Institute, which would have 100 astrophysical research scientists, may possibly relocate from the National Research Centre, Ottawa, to Victoria within the next few years. This would create a further demand for advanced networking to/from the Victoria area.

5.7 Service Sector Companies

Victoria has a concentration of small to medium sized companies and organizations which are networked to the mainland at data rates from voice grade to 56 kbps.

A small number of banks, wholesale, retail and financial/insurance companies have voice grade data network facilities or carrier network services linking between 6-12 localities in the Region. The appreciation for telecommunications applications in this segment varies greatly. Awareness education is necessary. *A typical feeling among those who expressed opinions is that the cost of facilities and services inhibits network growth.* BC Tel's reputation for support and customer back-up is generally high, however cost is an issue. There was some interest expressed in shared user networks as a means to reduce costs.

The Real Estate industry currently makes heavy use of dial-up access by agents to the multi-listing computers. The Vancouver Island Real Estate Board hopes to begin distributing its database to its agents, via switched digital 56 kbps service, in 1992. This system will eventually utilise ISDN wherever the service is available as it will incorporate picture imaging. The Board expressed dissatisfaction that the service is not scheduled to be available north of Nanaimo before the latter part of the decade. At least one major national Real Estate firm, with offices on Vancouver Island, will be implementing a database/imaging network for the use of agents within the next year.

5.8 Education

Although there is only limited use of telecommunications in the K-12 schools to date, it is not for want of knowledge or ideas. Most school boards appear to be aware of the potential of educational technology. However, to date almost all usage has been confined to administrative and financial applications. In Victoria and Courtenay, for example, 60 and 25 schools respectively are linked to school board computers by asynchronous leased lines.

The use of computers for instruction is widespread, though any networking is generally confined to LANs. There are two important projects involving more widespread networking by schools in BC, which will eventually result in Vancouver Island/Coast region schools applying the same technology. The first - the "Learning Connections" project in Vancouver - is being conducted at Prince of Wales Senior Secondary (PW) in Vancouver in conjunction with System House in Vancouver and a high school in Nova Scotia. PW has a leased line connection to BCnet, which is currently being used for e-mail. It will soon be used for full Internet connectivity so they can have terminal access to library catalogues and bulletin boards, as well as file transfer capability and direct access to network news.

The second, much larger Southern Interior Telecommunications Project (SITP), is half way through its two year cycle under the sponsorship of the Ministry of Education's Educational Technology Centre (ETC) in Sydney. This project involves 70 schools in 11 school districts. The project partners also include BC Tel, Simon Fraser University and DEC. The network facilities include dedicated or dial-up access, via the BCSC DNET, to Bcnet. During the second phase of the project, several of the more advanced applications are being mediated through a regional computer.

The project is designed to prove out the use of e-mail, computer conferencing (with on-line access to experts in various fields), and access to databases such as Dialog and Infoglobe in school curriculums. The ETC strategy is to provide province-wide access, migrating from a $6-10 million basic program to a wideband approach offering high quality multi-media facilities. The most cost-effective and creative way forward would also be to combine the network access requirements of libraries, government offices and businesses from each community, thus gaining the benefit of user-sharing economies, as well as assisting economic development outside of the public sector. However, the implementation strategy for this network has still to be finalised.

5.9 Libraries

Libraries are actively trying to increase telecommunications usage. Many feel that this is key to the survival of rural libraries, and to the updating of library services (both in urban and rural settings). The three main network applications are database access, on-line requests, and electronic delivery from one location to another.

Currently, 72 library jurisdictions throughout BC use Envoy, the public e-mail service, for interlibrary loans from headquarters to headquarters, between jurisdictions. These include Victoria (4 branches); Vancouver Island Regional Library (38 dispersed branches with headquarters in Nanaimo); Alert Bay; Saltspring Island; Pender Island; and Powell River. The two

making the most use of networking generally are Vancouver Island Regional Library (VIRL) and the Greater Victoria Public Library. The greatest resistance to change comes from libraries in small communities, many of which are still fully manual.

VIRL currently has 14 online locations, with private lines running at 4.8 kbps. The remaining 24 branches of the library use mainly faxes. There are plans to extend the network, but these are not clearly laid out as of yet. Datapac has been considered, as possibly a more cost-effective solution than private lines. The libraries most in need of connection are Colwood/Langford, Lake Cowichan, Ladysmith, Bella Coola, Port Hardy, and possibly Chemainus and Port McNeill. However, the more rural areas such as Gold River, Cumberland, Hornby Island, Massett, Port Alice, Port Renfrew, Quadra Island, Sointula, Sayward, Tahsis, Tofino, Ucluelet, and Woss Lake may be favoured for strategic reasons. Regardless, little is expected to happen before 1993 or later.

The university and college libraries use the Internet e-mail (via BCnet) as much as possible because it is less expensive than Envoy. BCnet is also used for accessing other post-secondary institutions' library catalogues and as the gateway to databases at UVic, UBC, and SFU. Datapac is also used to access data bases. The OLA's Electronic Library Network initiative directly concerns post secondary institutions. A technical study undertaken by OLA suggested using BCnet and the government network (DNET) to interlink all post secondary institutions, to encourage resource sharing.

The National Library of Canada is currently looking at telecommunications applications, although activities are currently still only in the planning and discussion stages. These include: research on the use of Canet for interlibrary loan applications, a national strategy for resource sharing, and study of ISO/CSI standards issues for libraries.

5.10 Tourism

This sector has a growing importance in the region. The use of telecommunications varies greatly. The majority of hotels, resorts and travel information bureaus handle their business manually, using only the telephone and fax. Several chain operators, and almost all travel agencies, use dedicated leased lines to provide instantaneous, up-to-the-minute booking information and services.

Most travel agency reservation systems involve accessing a distant computer via private lines at 4.8 kbps. There is a move to increase speeds and to utilize switched X.25 technology. The growing volume of travel industry data services will lead to more distributed network architectures, with storage and

processing at the LAN level. The use of e-mail and electronic funds transfer will also increase.

Hotel chain operators typically have a central reservation system in Vancouver. Several have 9.6 kbps leased lines to Victoria. A small number of leased lines also exist to Nanaimo, Campbell River, Duncan, Courtenay, Parksville, Ucluelet, Gold River and Tahsis. At least two companies surveyed would like to increase their data speeds but are currently not willing to pay the additional network costs.

The Government's Travel Info Network is planning to adapt an on-line database and computerised reservation system. It will utilize a block booking system, with updating and confirmation by telephone or fax. This approach appears to be the most applicable to the vast majority of tourism establishments for the next few years. Individual hotels and resorts with computerised reservation systems are not necessarily immediate candidates for networking unless a beneficial and attractively priced value added service were marketed to them.

Hotels are also not prime candidates for wideband technology (eg. video conferencing) on account of low client demand. The most valuable network services identified were 1-800 reservation lines and improved radio telephone communications in the more remote fishing areas, where the expansion of BC Tel's Autotel service would provide more privacy and commercial viability.

6.0 APPLICATION OVERVIEW

6.1 General

Figures 3.1 and 3.2 provide an indication of the current and potential (future) users of telecommunications services determined from the user inventory. The future applications table refers to the 1993-95 time frame.

The tables are arranged to indicate the sectoral use of all the applications surveyed, coded to indicate the degree of penetration, namely:

- used in all or almost all communities
- used mainly in large or intermediate sized centres and/or in a few localities only
- used mainly in the larger urban centres or by only a small proportion

The applications are arranged from left to right, in approximate order of their data speed requirements. Facsimile is in the first column by virtue of its almost universal acceptance. Generally speaking, the level of penetration decreases towards the right.

6.2 Bandwidth Requirements

Communication channel bandwidth in a digital network is virtually synonymous with *transmission speed*. In data communications, the term "narrowband" has traditionally referred to *voice grade* data signals of 9.6 kbps or less. These can be transmitted over a standard analogue telephone voice channel. Modems today facilitate data transmission at up to 19.2 kbps over a single private line or switched voice circuit guaranteed for information service access (ISA).

The advent of basic ISDN will effectively redefine the *upper limit* of *narrowband* to 64 kbps. The basic rate network access will offer two 64 kbps channels, plus one 16 kbps channel (2A+B).

Virtually all of the existing data speed applications identified in the user survey were between 4.8 - 19.2 kbps. In terms of the predominant text oriented traffic, a single page requires approximately 2 kbytes of computer memory. Hence a one page message can be transmitted in 1 second at 19.2 kbps. A medium sized report, or an uncompressed image document containing, say, 250 kbytes of information requires approximately 2 minutes transmission time.

Where multiple terminal and file transfer activities are multiplexed together, the *total data throughput* between network hubs is dependent on the total

traffic volume. Network data speed upgrades are thus required as the following increase:

- the number of users
- their frequency of network access, and
- their file transfer requirements.

The data speed requirement will increase radically once high resolution graphics such as medical scan images, GIS or CAD/CAM files are transmitted frequently. These files typically contain between 4-12 Mbytes of information. An uncompressed 8 Mbyte file requires 55 minutes for transmission at 19.2 kbps, 19 minutes at 56 kbps or less than one minute at 1.544 Mbps (T1). Although compression techniques can reduce transmission times by a factor of 4, fractional T1 circuits (eg., a ¼T1 circuit operating at 384 kbps) are essential if such files are required for real-time or near real-time.

The user survey was unable to evaluate the actual access time requirements for all possible uses of imaging. However, the following summarizes the applications for which a minimum of T1 or fractional T1 networking will be required:

- GIS: The Government's Land Information Infrastructure (LII), currently under development, will create a need for a large number of map file transfers between Victoria and offices elsewhere in the region (eg. Nanaimo, Courtenay, Campbell River, Port Hardy, Gold River, Port Alberni, Tofino, Tahsis, Powell River). Several ministries will utilise GIS networking from 1993 onwards. The level of operational urgency will not be high in most cases, but the volume will drive the need for high speed links. In addition to government, forestry companies, municipal authorities, BC Hydro, and engineering companies will be users of GIS files.

- Medical Imaging: X-Ray and scan images are similar in size to GIS files. The development of the protocols for retrieval and transmission of large image files, to facilitate inter-hospital on-line viewing for clinical purposes, will take a few years to perfect. The geographical extent of the requirement will also grow slowly, as trials investigating the benefit and operational problems of tele-health technology are undertaken.

- Document Imaging: The land titles office will pioneer the first high-volume network application for document imaging. Province-wide requirements will result in BCSC providing a ¼T1 backbone to various locations in BC. This and other applications, with customer data speed requirements of up to 64 kbps, will provide demand throughout the region. Lawyers, banks, realtors, engineers and various other private

sector organizations will be users of these systems within the next two to three years.

- Ethernet and LAN Interconnect: Fully transparent internetworking would require speeds of 10 Mbps. At a minimum, several T1 interconnections will be required between Vancouver and Victoria and possibly to other major company or ministry locations such as Nanaimo or Campbell River, within the next two to three years.

- Video conferencing: BC Tel has demonstrated its Video Forum service, which uses ½T1 compressed video operating at 772 kbps, to potential government and private sector clients. Video-conference applications will become attractive for a number of organizations in higher education, health, industry and government over the next few years. The economic justification will be primarily travel savings. The locations could be as numerous as those listed under GIS.

- CAD/CAM Internetworking: This need will most likely be restricted to the Victoria area and between Victoria-Vancouver for the foreseeable future.

6.3 Summary of Results

The current use table (Figure 3.1) indicates that the penetration of information technology networking (beyond fax) is to date significant in only the main urban centres, primarily Victoria.

The potential usage table (Figure 3.2) shows that there will be significant increases in penetration in all categories. For example e-mail, EDI and database information retrieval systems could potentially spread to all intermediate sized locations and, in some sectors, to all localities. Imaging and video conferencing will have a potential market down to intermediate size locations. However, as noted in the descriptive section, measures to improve public awareness, to effect service cost reductions and to demonstrate the benefits of these services will need to be implemented.

FIGURE 3.1: CURRENT USERS OF TELECOMMUNICATIONS SERVICES

	FAX	TELECONF (AUDIO)	E MAIL & BULLETIN BOARDS	REMOTE TRANSACTIONS (EFT)	EDI	DATABASES & INFORMATION RETRIEVAL	DOCUMENT IMAGING	HIGH DEFINITION IMAGING, Incl. GIS, CAD/CAM	VIDEO CONF
EDUCATION	•		▼			▼			
ADVANCED EDUCATION	•	▼	▼			▼			
LIBRARIES	•		▼			▼			
HEALTH & MEDICINE	•		▼		▼	◘	◘	◘	
RESEARCH	•		▼			◘		◘	
GOVERNMENT SERVICES	•	▼	▼	▼	▼	▼	◘		
RESOURCES & MAPPING	•	▼	▼			◘			
MANUFACTURING & OTHER INDUSTRIES	•	▼	◘			◘			
TOURISM	•		◘		◘	◘			
FINANCIAL & OTHER SERVICES	•			•		◘			
TELEWORKERS	•	▼	▼			▼	◘		

• Used in all or almost all localities.

▼ Used mainly in large and intermediately sized centres, or in a few localities only.

◘ A small proportion found mainly in larger urban centres, or by only a small proportion.

FIGURE 3.2: POTENTIAL USERS OF TELECOMMUNICATIONS SERVICES

	FAX	TELECONF (AUDIO)	E MAIL & BULLETIN BOARDS	REMOTE TRANSACTIONS (EFT)	EDI	DATABASES & INFORMATION RETRIEVAL	DOCUMENT IMAGING	HIGH DEFINITION IMAGING, Incl. GIS, CAD/CAM	VIDEO CONF
EDUCATION	•	•	•		▼	•			■
ADVANCED EDUCATION	•	▼	•		▼	•	▼	■	▼
LIBRARIES	•		•		•	•	•		
HEALTH & MEDICINE	•	▼	▼	▼	▼	▼	▼	▼	▼
RESEARCH	•	▼	▼			▼	▼	■	■
GOVERNMENT SERVICES	•	▼	▼	▼	•	▼	•	▼	▼
RESOURCES & MAPPING	•	▼	▼			▼	▼	▼	▼
MANUFACTURING & OTHER INDUSTRIES	•	▼	▼		▼	■	■	■	■
TOURISM	•		▼	▼	•	•	▼		
FINANCIAL & OTHER SERVICES	•		▼	•	•	▼			
TELEWORKERS	•	▼	▼	■	■	▼	■		

• Used in all or almost all localities.

▼ Used mainly in large and intermediately sized centres, or in few localities only.

■ Used mainly in large urban centres, or by only a small proportion.

7.0 INTRODUCTION

7.1 General

This aspect of the study involved the evaluation of major initiatives taking place throughout the world, in which telecommunications have been used to promote economic development. The relevance of these initiatives to the BC context was assessed.

INTELECON consulted and summarised a wide range of published and unpublished materials to undertake this work. This involved primarily a desk-based literature review, with input and advice being provided by telecommunications experts working in association with us on this part of the project.

In particular, material and input was provided on activities of the Commission of the European Community (CEC) from Ibex Consultants of Harrow, London. Ibex has carried out several studies concerning the development of projects for the CEC's strategic telecommunications program, and has seconded consultants to the CEC in Brussels to assist with the development of initiatives for the regional telecommunications and rural development (STAR) programs.

Also, Dr. Heather Hudson, a noted international telecommunications development policy analyst, provided INTELECON with material on some US initiatives, as well as activities taking place in Australia, Scandinavia and elsewhere.

7.2 Jurisdictions and Methodology

According to the Terms of Reference for the study, only a few initiatives taking place elsewhere in Canada and worldwide needed to be consulted for lessons to be learned for BC. It did not take long for the study team to realise that looking at only one or two in detail would not have provided a clear enough overview of lessons to be learned and developing trends. This is due in part to the diverse structure of the Vancouver Island/Coast region, the variety of types of initiatives under way throughout the world, and the fact that many of the telecommunications initiatives being undertaken are quite new and have not always been effectively assessed for their strengths and weaknesses.

Overall, 37 initiatives were studied: 21 are European (both regional initiatives and single country activities, including some in Scandinavian countries); 9 originate from the US, including Hawaii; 2 are Canadian initiatives; and the remainder are from Japan (2), New Zealand, Australia, and Singapore.

For ease of reference and comparison, we attempted to glean the following information from the materials on each of the initiatives:

- **Jurisdiction** - country or region of origin, sponsoring organization, and name of initiative.

- **Type and Purpose of Initiative/Activity** - the sector involved (eg. education), whether it is special interest, urban, or rural in focus, and a brief note about the aim of the initiative and the type of technology involved, if any (eg. advanced high speed network versus ISDN).

- **Technical Specifications and/or Project Development Plans** - activities planned or under way to undertake the initiative, including information on infrastructure development schedules, where applicable and available, and status of the initiative (eg. whether still being planned or if currently under way).

- **Development Costs** - this often referred to estimated costs over a given period of time, or total funds allocated to the project from government or other sources.

- **Policy Issues** - policies created as part of those governing the actual initiative, or telecommunications or other government policies of the jurisdiction in question that have a direct bearing on the initiative (eg. telecommunications regulatory policies of the CRTC).

- **Comments** - notes that do not fall within the above categories but that are of interest to the study.

It was not always possible to get all the data on each of the initiatives because we restricted our research to primarily literature reviews. For example, we found that the development costs were often not provided or were difficult to ascertain. This is most likely because the initiatives under study are generally leading edge activities with few role models upon which to base cost assumptions. It was sometimes possible to augment the information from literary sources through our associations with Ibex and Dr. Hudson. The results of the review were tabulated and are provided as Appendix D1, *Table of Strategic Initiatives.* A list of our sources is provided as Appendix D2.

A separate assessment was made of the applicability of these initiatives to the BC context. This assessment is provided in detail in Appendix D3, and is summarised in Section 9 below.

7.3 Types of Initiatives Included

As noted, the Vancouver Island/Coast region is far from uniform. For example, it includes a sophisticated metropolitan area, small towns and very remote communities. Its population is concentrated mostly along the south east coastal plain running from Victoria to Campbell River, while some northern areas, particularly the mainland portion, are remote and sparsely populated. The Region also varies greatly in terms of its terrain, its level of economic development and diversity, and its degree of access to infrastructures, particularly telecommunications.

For these reasons, we chose to study a diverse set of initiatives. These range from small scale rural projects using available infrastructures (eg. projects sponsored by the Development Board for Rural Wales), to large scale and expensive initiatives involving the implementation of very high speed special purpose broadband data networks (eg. VENUS, RACE, CANARIE). The initiatives chosen also cut across various sectors including health, research, education, business, and tourism. All of the initiatives have as a basic premise the goal of using telecommunications for economic development and diversity, or increased competitiveness.

8.0 SUMMARY OF FINDINGS

8.1 Other Jurisdictions' Activities

Around the world, massive spending on new networks reflects the widespread view that the speedy development of infrastructure is essential to development, long term competitiveness, and the evolution of industries for survival in the Information Age. This is the rationale for projects ranging from the STAR program, for upgrading the infrastructure in peripheral regions of Europe, and the EEC's high speed broadband RACE program, and the USA's Internet upgrade, to Japan's INS Net project, to name only a few.

Even where massive spending has not taken place, attention has been paid to issues surrounding the need to enhance access to information-based services and facilities. Lower budget activities generally have as their rationale the same aim of preparing a country or region for the impending changes accompanying the arrival of the Information Age. The need for rural and remote areas to be prepared for changes to the economic activities fuelling the new era is as great if not greater than the need for urban areas to be prepared. Where large infrastructural activities are not being pursued, lower budget endeavours such as pilot projects are being carried out.

Infrastructures require up-front investment, and are thus one of the riskiest areas of technology policy. In retrospect, for example, the French widespread use of multimode fibres in the 1980s was a mistake, while Japan had to substantially alter its early INS project to upgrade the digital data rate from 88 to 144 kbps, in order to conform to international standards. In the private sector, the likes of MCI, Sprint and IBM have each had to write off major investments on failed gambles in fibre and satellite networks. In Europe, the early vision of a converged and integrated broadband multimedia network serving telecommunications and broadcasting needs is now recognised to have been either flawed or way ahead of its time, since the two industries have developed separately and continue to do so, for both cultural and regulatory reasons.

The lessons for BC are not necessarily obvious. However, the confusion of failures elsewhere over the past decade are no excuse for inaction, as there is growing evidence that the use of new services and communications network technology are about to take off, and their growth is still likely to be influenced significantly by policy.

8.2 Issues Identified

8.2.1 Government Support or Intervention

The most successful experiments (INS in Japan, Minitel in France, and most notably, initiatives in Singapore) have had strong government commitment and coordinated investment or regulation to encourage a chosen direction of technological evolution. This is difficult to achieve in regulatory environments (such as Canada's) where cross-subsidies from services to terminal equipment, as in the Minitel model, are not permitted, and where long distance to local service cross- subsidization is no longer feasible.

Benefits are likely to be realised to the economy, but the cost to telecommunications operators is high, especially in the first few years because of long user take-up times. This has implications for government and policy.

One area where government intervention and support will likely be essential is in the deployment of educational networks and initiatives. Such initiatives will probably not be money makers and so their implementation on a strictly commercial basis is not likely.

While commercial enterprises will probably not take on an initiative singularly, with strong government support and leadership, they may wish to become involved. Partnering arrangements, for example (see below), could be set up. Commercial enterprises could benefit from arrangements providing the opportunity to research and develop services and facilities that can be marketed elsewhere in the future. In this way, government support in educational projects, if well planned and orchestrated, could aid both the educational sector and the commercial R&D sector. Virtually all of the educational initiatives identified for this study involve some degree of government support and intervention (ie., DELTA, ERVING, MISSISSIPPI 2000, Scotland Highlands and Island Enterprise, NREN and the Internet, the New Zealand distance education initiative, CANARIE, and Singapore's School Link).

It may be possible to deflect the need for direct government intervention in the development of an educational network by having educational networks piggyback on existing commercial networks. This would be an inexpensive way of developing an educational network, given the goodwill of the commercial entity. However, there are strong social dis-incentives to adopting such an approach. Mainly, will the commercial enterprise involved heed educational needs and priorities in their network development activities, or will educational and social interests become completely overshadowed? The government has a mandate of social responsibility towards education that may not easily be reconciled with commercial needs.

Overall, government support and intervention in initiatives ranges from *minimal* (eg. in broadband commercial services in the US like CO+RE, RBOC activities, and the Commercial Internet Exchange), to *very heavy* (eg. Singapore's highly interventionist approach to a wide range of activities, and Scotland's Highlands and Islands ISDN initiative). Most activities involve varying degrees and types of government involvement.

The government's need to justify its involvement in projects varies from jurisdiction to jurisdiction depending on the political environment. The centralist government in Singapore need not provide an explanation or rationalisation for its interventionist methods. In the US, however, the government's involvement in such things as NREN must be justified against the competitive, free enterprise environment in which many people feel such initiatives should develop. The government's justification in the case of NREN is that without government involvement, no network of this calibre would develop since no commercial enterprise could take the necessary risk for such a large-scale infrastructural development. The break even point would be too long awaited and is not easy to predict. The plan calls for the government to be involved at the start-up only.

8.2.2 Demand and Policy

Many of the projects being undertaken can be described as resulting from a "technology push" stance. That is, most are being carried out without any true indication of the demand for the services or facilities being provided.

Currently, the speed at which new image oriented and interactive multimedia services will be taken up on a large scale is open to question. Also open to question is whether they make a difference economically to those regions which have them first. Governments are therefore struggling with the issue of what should be done to ensure that their particular country or region is able to take advantage of whatever benefits there are from keeping up with the technological opportunities. In the end, governments see it as their job to help ensure that if telecommunications could make the difference as to whether the people of the region can survive and thrive in the economy of the 1990s, then suitable strategies to encourage take-up and the growth of demand should be put into place.

With respect to broadband initiatives in particular, no trial has yet revealed a true mass market for new broadband services. Where demand has sometimes been described as latent before a system has been implemented, it has generally not materialized after the fact: most videophone experiments, for example, must be judged commercial failures. Many advanced business applications, as well as other home user applications (home shopping, banking, etc.) can be achieved on "narrowband" basic

ISDN. Even videophone is now deemed feasible at 64 kbps (though the picture quality is still poor).

8.2.3 Promoting the use of information based services/facilities

In many of the projects, it was often unclear to potential users how they could adopt or integrate information based services into their daily interactions. Promoting and training in the use of services and facilities, and also, providing inexpensive incentives to stimulate the use of these at the outset, were deemed to be very important. Where this did not seem to be needed was amongst those active in the advanced technology sector, where the costs and benefits of using such services were already recognized.

8.2.4 Degree of rurality and ability to benefit

Where other infrastructural developments are lacking (eg. decent roads and educational opportunities), development of the telecommunications infrastructure for enhanced access to information services and facilities is not likely to pay off. The greatest benefits will be felt in peri-urban areas. Most remote localities in the Vancouver Island/Coast region, however, are less hindered by lack of physical infrastructure than by sheer distance and size of the local population. Educational and re-training opportunities are the key infrastructural ingredient to participation in the information economy.

8.2.5 Partnering and Sharing

The idea of developing partnerships, to share the costs and benefits of services and facilities, has been one outcome of a number of the initiatives and projects, as in the regional *Inventory of User Needs and Knowledge*.

Potential users cannot always justify taking advantage of useful services and facilities due to high implementation or usage costs. Sometimes the problem is that users are bound to purchasing more capacity than they are able to use themselves. Or, service providers may be unwilling to invest in the infrastructure developments needed to provide a service, even where technologically capable, if it appears that only a small portion of the capacity will be utilized.

This problem can sometimes be alleviated through pooling of demand, by bringing together a number of users in a group to share the use of facilities or services. However, this does not necessarily improve the situation from the carrier's perspective, although it might force recognition of the demand to some extent.

A variation on this strategy, dealing specifically with the rural environment, has been suggested in the US by the Office of Technology Assessment (OTA) of the United States Congress. They suggest that Rural Area Networks (RANs) be created within small communities or areas. These networks are configured along geographic boundaries rather than functional boundaries like LANs would likely be. "Designed on the basis of a ring, or campus type, architecture," an OTA report suggests, "a RAN would link up as many users within a community as possible - including among them businesses, educational institutions, health providers, and local government offices. Rural Area Networks could be linked state-wide, perhaps by piggybacking on the State government and/or the State educational network.

Rural Area Networks have a number of advantages:

- RANs would foster the deployment of advanced technology to rural areas in an economically viable manner. By pooling diverse users, they would provide considerable economies of scale and scope.

- Built to meet shared needs, they could foster cooperation and community ties.

- RANs would overcome the limitations of technological expertise in rural areas since they could be designed by one systems integrator.

- RANs would induce communication providers to be more responsive to the communication needs of rural communities. By joining forces, rural users will be able to exert greater leverage in the marketplace.

It is not necessary to be in a rural environment for sharing to take place. A number of users may wish to join forces within a small urban community, such as Port Hardy, in order to make the leasing of capacity economic and justifiable.

Partnering is slightly different from sharing in that in involves the cooperation and goodwill of numerous interests -including users, service and equipment providers, and government - to make projects feasible. An good example of such a partnering is the Mississippi 2000 fibre optic interactive distance education project. The actors involved in this project, and their contribution, are: *South Central Bell*, who provided the network architecture and associated network products and services; *Northern Telecom Inc.*, who provided fibre terminal equipment to carry the two-way video DS3 signals from each location to South Central Bell's nearest office; *ADC Telecommunications*, who provided the video multicast switch; *The State of Mississippi*, who provided the classroom video infrastructure materials; and *IBM* and *Apple*, who donated computers and other equipment and services.

Early assessments of the initiative suggest that the partners have achieved the two goals they had set out: to gain experience, and to develop equipment and procedures that will be useful in the future. Also, this initiative has demonstrated the use of fibre for distance learning over the public switched network in a manner that can be replicated in other areas. The pilot project is to last a year and a half, and development of the system will be ongoing throughout this period.

8.3 Where are Initiatives Headed?

It is quite clear that overall, there is movement towards implementation of broadband capabilities. However, this does not suggest that in every situation, broadband should be implemented in the short term.

Given the difficulties associated with determining demand, and some of the failures that have resulted because of it, a number of projects are now being geared towards responding to demand only as it materializes. This is the case in France's Numeris (ISDN) initiative. It is also the case with the RBOCs in the US. Given the commercially competitive environment in which the latter must survive, and lack of government intervention in their activities, this is not surprising. It seems, then, that although broadband is important for intra-company, large corporate networks, for video conferencing, and for experimenting in a wide range of special applications (such as education and health), caution is being shown towards its general implementation.

Program broadcasting remains overwhelmingly the most important demand for large bandwidth. As long as the regulatory climate maintains separation of telecommunications and broadcasting, the "local loop" for broadband will remain with cable companies for all but the large corporation and government networks, for a considerable while to come.

A general lesson which emerges from the study of other jurisdictions is that two contradictions are emerging. The first is between the technological vision (of an information technology utopia), and the market place reality (the demand for it). The second is the conflicting dimensions of policy, which seem to espouse a grand infrastructure strategy while encouraging fragmentation through the virtues of competition. The competitive environment tends to reduce the benefits of economies of scale.

For example, if the pursuit of an integrated fibre optic based broadband scenario is thought to be desirable, it is likely to be significantly delayed by the level of:

- sunk investment in current technology, and
- emerging competition and fragmentation in service provision

In addition to the high cost of the copper plant already in place mitigating against rapid replacement, the continued liberalisation of cellular, personal communication networks (PCNs) and satellite based services is increasing the options available to users. Cellular and PCN services can offer an increasing range of voice and data services. In the not-to-distant future, wireless PCNs will threaten the traditional local loop market of the telephone companies. In some new growth areas, it is conceivable that some customers may choose a PCN service over the basic telephone service. Combine this with a coming explosion in demand for business VSAT networks and the business market will also be severely fragmented in two to three years. The spread of datacasting will also provide another form of network by-pass for a potentially large group of users, at an even lower cost than VSATs, for some distributed data applications with limited inter-activity requirements.

In summary, the de facto reality is that the pace of technological innovation and market liberalisation have the combined effect of encouraging competition between networks, and shorter term investment horizons by both network providers and users. These impacts are tending to outweigh the effects of industrial and technological policy.

9.0 APPLICATION TO BRITISH COLUMBIA

9.1 General

As previously stated, all the initiatives studied had as a basic goal the use of telecommunications for economic development or diversification. This then formed the first criterion for assessing the applicability of the initiative to the BC and Vancouver Island/Coast context.

Other general criteria used to judge the applicability were as follows:

- **Scope** - is the initiative taking place in a similarly placed jurisdiction (eg. is it geared towards the national, regional or sub-regional level)? Are there similarities in terms of involvement by various interest or power groups?

- **Environment** - is the initiative one which could be easily replicated in a region like BC which boasts geographic diversity and a relatively low and dispersed population? Is it more relevant to urban or rural realities in the region?

- **Policy Issues** - is the initiative happening in a similar policy environment, or where there are similarities in terms of profit motivation, competition or other related issues?

- **Lessons** - even where the initiative did not entirely meet the above criteria, are there specific lessons that could be learned by BC?

Determining applicability of these initiatives to the BC context sometimes required simply an informed judgement.

9.2 Most Interesting Initiatives for the Vancouver Island/Coast Region

9.2.1 Highlands and Islands Initiative

This initiative is highly interventionist and involves developing policies and programs to counterbalance disparities which may result from the market forces which determine the development of communications infrastructures.

This initiative is relevant to the BC and Vancouver Island/Coast regional context on a number of counts. First, it is sub-regional in scope, focusing on a regional area requiring particular attention. Also, it deals with a region that is similar to the Vancouver Island/Coast region both geographically and in terms of population distribution.

Some of the business related activities undertaken for this initiative include:

- presentation by British Telecom and Highlands and Island Enterprise to local businesses whenever an ISDN switch is installed in the local area;
- studies are being undertaken on the main sectors of the economy to determine specific ways the sector can be developed, and how telecommunications can be used by the sector;
- choosing role models and influencers in a community and assisting them in integrating the use of information technologies in their daily activities.

One of the pilot projects under consideration at this time is one which will demonstrate the advantages of the speed and bandwidth available with ISDN. It would use the full capability of the technology, including a video channel, to deliver information technology training to remote areas, and to compare the results with more conventional remote training. There may be interesting lessons from this initiative that would assist with one of the possible projects suggested for the Vancouver Island/Coast region, namely, retraining of laid-off workers in Port Alberni and other locations using telecommunications. North Island College may also benefit from hearing about the activities associated with this project.

The techniques and technology used may, in fact, be very similar to those used by the OLA and the Vancouver School Board in their ISDN distance learning trial. A comparison may be very beneficial.

One of the main lessons learned by the Highlands and Island Development Board in initiating projects is that rushing in to a pilot such as this one on training is not recommended. In developing policies and projects in support of such trials, they recognized that careful project design and proper evaluation are more important than speed, if the results are to be impressive.

Although this initiative provides some interesting elements for consideration by the Vancouver Island/Coast region, it should be noted that the Highlands and Islands project has not received any substantive evaluation. As a result, it may not be as useful for guiding future BC activities as it might have been. The initiative has also been criticized as being one which throws large sums of money and technology at rural areas without due planning, as the lesson mentioned above has pointed out.

9.2.2 Wales Development Board

This initiative is attractive in that its aims are to identify pilot projects that can be operated on the existing infrastructure, can be implemented in the short to medium term, and are low cost. The pilot project scheme was deemed by

policy makers to be an easy and inexpensive way to test demand and the effectiveness of applications in meeting this demand.

This initiative is of particular relevance to the rural areas of the Vancouver Island/Coast region as it is rural and sub-regional in context, and concentrates on capitalizing on present capabilities without the risk involved in making large infrastructural investments. Such an initiative is important in that it is an inexpensive way to increase awareness and encourage the use of information technology. It is also recognises the constraints under which, according to present plans, parts of the Vancouver/Island Coast region may not have access to ISDN until well into the latter half of the decade.

Some of the pilot projects undertaken include:

- coordinating activities of centres already involved in information technology projects to reduce danger of duplication of services
- creation of telecentres (like telecottages) to provide telecommunications and information technology services
- increasing awareness about information technology and telecommunications services and potential
- encouraging increased use of information technology and telecommunications where benefits would result (eg. where potential users were reluctant to try new services)
- providing information technology training
- providing information services or easier access to information
- improving coordination and communications between Tourist Information Centres
- provision of more information about EDI

One of the important lessons learned that led to this choice of action by the Wales Development Board was the fact that a lack of awareness (and hence demand for services) often impeded the success of projects. Another important lesson learned was that needs within even a small region may vary greatly, and projects, to be successful, must be relevant to the community in question.

9.2.3 Numeris

Although not a great deal of information was available on this initiative, it appears to have important lessons for BC. From a previous initiative (Biarritz), France learned that high profile, high technology initiatives were often ill-conceived. A promise to link millions of homes with fibre fell so far behind target that it was eventually dropped. Since then, cable has spread with private investment and lower technology systems. Government involvement has also shifted to concentrate on issues such as basic ISDN for small business. Failure of the plan was attributed to a number of things, including poor marketing, high tariffs, a lack of strong leadership and control, and a lack of real demand.

The ISDN strategy, Numeris, is more demand oriented than most other initiatives under way. It encourages private investors to join in partnerships with France Telecom, which provides a third of the costs to develop specialized services for sectors such as hospitals, travel agents, real estate agents and retailers.

The results so far seem quite positive. The take-up time for the technology is faster than in other countries, even though tariffs are still relatively high. This demand oriented approach is thought to be the way things will go into the 1990s. Lack of success with supply driven modes is the reason.

In the BC context, there may be lessons from the France Telecom experience which could be applied in government thinking towards both BC Tel and BC Systems Corporation. BCSC has already undertaken projects which involve partnership or cooperation with the private sector. Could more be done to encourage BCSC to fill a similar partnering role as that played by France Telecom to encourage developments, particularly sector-specific ones in which needs might be easily identifiable? Or should BC Tel be encouraged to play that role, with Government committed to playing the role of user or part financier?

9.2.4 Telecottages, or Community Teleservice Centres

The aim of the Telecottage initiative in the Nordic countries was to provide small, rural communities with communal access to telecommunications, data processing and computer assisted services, to help offset the disadvantages of rurality. This government funded initiative was part of a strategy to diversify and reduce dependency on agriculture or resource based industries. It has been considered a success in that the number of telecottages, and their use, has seen a steady increase. However, they almost exclusively depend on government subsidization whereas it was hoped they would become self-sufficient. The fact that they still require funding, though, is offset by the benefits which seem to accrue to the users and the communities with access to such facilities.

The telecottage idea is relevant to BC, given its regional focus and the fact that the Nordic countries share with BC similar geographic and population realities. There has also been an attempt in BC to introduce a somewhat similar initiative, through the Open Learning Agency's Community Campus Network proposal. The proposal, which was tabled this year but did not get funded, was specifically geared towards education, but could be expanded to include aims like those included in the telecottage initiative.

The Community Campus Network sites would have built upon facilities already available in each community such as local libraries, schools, community colleges, universities and workplace sites. Some may have required the installation of simply a computer to provide access to information and services. Others might have needed the provision of systems from the simple fax machine to electronic networks.

It may be worthwhile, within the context of this needs assessment study, to reconsider a broadened Community Campus Network proposal, as a possible pilot project to be undertaken.

9.2.5 Singapore

In Singapore, a sophisticated telecommunications network is being implemented in the hopes of evolving the country into a developed information society. The government plays a leading, highly interventionist role in this by providing the complete telecommunications infrastructure. It also provides the application gateways for accessing services, such as via its *Teleview* national videotex service. The plan for Teleview is to put a personal computer, with access to electronic mail and a host of directory, educational and special purpose services into a million homes.

Singapore's approach is also to force organizations to comply with the use of the infrastructure for various services and activities. An example of this is within the garment industry where the government has forced its hand. There are quotas in force in Singapore to limit production in the garment industry, and each company has to bid to be allowed extra production. The only way they can do so is on *Tradenet*, the nationwide EDI network hooked up to one of two supercomputers in Singapore. This forces all companies, large and small, to adopt the new technology if they wish to participate in the industry.

A similar activity took place in BC when *Teleplan* was adopted. This EDI service for the electronic submission of physicians' claims to the Medical Services Plan was imposed on physicians, with minimal prior consultation or marketing. Although originally fought against (especially given its forced implementation), the system is now recognized to have been effective.

Teleplan also relates to Singapore's *Medinet* in that independent development activities currently taking place in BC are expected to result in an integrated service. Medinet is the only nationally coordinated activity found in a study of the health sector worldwide. It is also the only one which covers all areas of the sector: electronic claims processing, procurement of supplies, disease notification, access to databases, and a national patient registry.

In summary, the Singapore case is a striking example of how an information technology vision can be converted into practical reality through an integrated strategy. Although the political, geographical and demographic environment is completely dissimilar from BC's, the lesson of how applications can be made available and valuable to a large proportion of the potential user base should not be lost. As noted, the Medinet model perhaps provides useful insights into how BC's Teleplan can be developed. Also, aspects of Teleview and its interleaved special applications should be seriously considered because of the ultimate need for universal, single-stop, user-friendly customer access, if information technology is to be widely accepted by small businesses.

9.2.6 The Cleveland Free-Net Community Computer System

The Cleveland Free-net was the first *National Public Telecomputing Network*. The concept behind a National Public Telecomputing Network (NPTN) is similar to that of public radio or public television broadcasting. One important distinction, however, is that it is not subsidized by the government. The Cleveland Free-Net, as an NPTN, provides a free, open-access, community computer system. The cost of setting up such a system is relatively low. Funds for setting up a system can be attained through user donations, grants and donations from private foundations, corporations, etc., and other fund raising activities. The key to the economics of operating the Free-Net is the fact that the system is literally run by the community itself. Every feature that appears on the system is there because an individual or organization in the community contributed time, effort, and expertise to bring it online and operate it.

The response to this initiative has been very positive. The prototype version of the Free-Net attracted over 7000 registered users and averaged between 500 and 600 calls a day on 10 incoming phone lines. In August 1989, Free-Net II opened and currently averages over 4000 logins a day on 64 telephone lines. At the moment the Free-Net has a user base of over 13,000 persons, which is expected to grow eventually to at least 20,000 registered users in the Cleveland area.

The response received by the Free-Net system proves that there is a demand for this type of service, provided access is simple and inexpensive.

Another of the positive features of the response that has been documented is the fact that the service is being used by a different segment of the populace than that traditionally reached by similar services. Users of commercial videotex services, for example, generally have the profile of: $50,000+ yearly household income, very well educated, overwhelmingly white, and overwhelmingly male. The Cleveland system draws as many users from the demographically blue collar areas of the city as from wealthier sections. That is, 86% of Free-Net users are over the age of 20 (average age 35.5 years) with a very deep "middle class" socio-economic penetration throughout the metropolitan area.

This is an example of an effective initiative that does not require intervention or assistance from the government. Communities in the Vancouver Island/Coast region could develop their own systems like the one in Cleveland and elsewhere. Reaching a different segment of the populace than is traditional is an important bonus to such a system as one important goal for the Vancouver Island/Coast region is to bring greater knowledge of information services and facilities to all people in the region.

9.2.7 The Mississippi 2000 Educational Project

Several US states are developing advanced educational networks, which indicates rapid growth in the use of information technology in education. However, the benefits are by no means proven at this stage and many of the applications are in their infancy. Some initiatives have dedicated optical fibre facilities, while the Mississippi 2000 project is the first to utilize the public telecommunications network for its main applications. The initiative is quite recent and has yet to be scrutinized carefully. However, the cooperation of the various players, including South Central Bell and system suppliers, has been the key to making this initiative move ahead. Each is benefitting from the opportunity.

APPENDIX B1

FACILITIES & SERVICES DATABASE

GEOGRAPHIC AREA	VICTORIA			SAANICH		
CITY/TOWN	VICTORIA	PORT ALBERNI	SOOKE	BRENTWOOD BAY	SAANICHTON	SIDNEY
BC TEL						
TRANSMISSION FACILITIES						
Microwave Analog	X					
Microwave Digital	X	X				
SONET LTS	1994					
Optical Fibre	X		1994	X	X	X
Copper Digital			X			
EXCHANGE TYPE						
DMS	1994	1996				
GTD-5	X		X	X	X	X
Other		X				
SERVICES						
Call Management	1992		1992	1992	1992	1992
Business Pac	X		X	X	X	X
SMART Features	X		X	X	X	X
Paxcon	X	1996	X	X	X	X
HATS	X	1996	X	X	X	X
Teleplus	X	X	X	X	X	X
Advantage	X	X	X	X	X	X
800 Service	X	X	X	X	X	X
Remote Call Forward	X		X	X	X	X
Envoy 100	X	X	X	X	X	X
iNET 2000	X	X	X	X	X	X
Traderoute	X	X	X	X	X	X
Teleconferencing	X	X	X	X	X	X
Video	X					
Datalink	X					
Datapac	X	X	X	X	X	X
Dataroute	X			X	X	X
Megaroute	X			X	X	X
Megastream	X			X	X	X
ISA	X		X	X	X	X
ISDN-BRA	1992					
ISDN-PRA	1992					
ARTOTEL Services	X	X	X	X	X	X
UNITEL						
FACILITIES						
Analog	X					
Digital Microwave	X					
Optical Fibre						
BC Tel Lease		X	X	X	X	X
SERVICES						
Paspac	X					
Mach III	X					
Private Line (Voice)	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X
Broadband Exchange	X					
Pacsroute	X					
Pacsroute Plus	X					

GEOGRAPHIC AREA	VICTORIA			SAANICH		
CITY/TOWN	VICTORIA	PORT RENFREW	SOOKE	BRENTWOOD BAY	SAANICHTON	SIDNEY
BC CELLULAR						
Class 1 Service	X		X	X	X	X
Class 2 Service						
CANTEL						
Class 1 Service	X			X	X	X
Class 2 Service						
BC HYDRO						
HV Circuit Termination	X				(Royal Oak) X	
BC Tel leased line						
CATV SYSTEMS			Note 1		Note 1	Note 1
Channels	29					
No. of Subscribers	115997					
Means of Reception	S49/024/H12					
Other	NOTE 1					
PEETS GRANT RECIPIENTS	YES (2)	YES (2)				
BC SYSTEMS CORP.						
SHA						
9.6 kbps	105		1			2
19.2 kbps	70					2
56 kbps	104					
1.5 mbps	4					
DOET						
9.6 kbps	27					
19.2 kbps	100					3
56 kbps	29					
1.5 mbps						
PROVNET PABX Trunks	1014 12000 centrex		14	3	4	85
BC RET						
9.6 kbps	3					
19.2 kbps						
56 kbps	1			2		
1.5 mbps						
ICBC						
19.2 kbps						
56 kbps	X					

GEOGRAPHIC AREA	VICTORIA			SAANICH		
CITY/TOWN	VICTORIA	PORT RENFREW	SOOKE	BRENTWOOD BAY	SAANICHTON	SIDNEY
NOTES	1. Cable subs. includes: Sooke, Langford, Colwood, Metchosin, Saanich, Sidney, Esquimalt, Oak Bay, View Royal		1. Included in Victoria figures.		1. Included in Victoria figures.	1. Included in Victoria figures.
PROFILE						
Population	276276	209			107173	9325
Number of Schools	122 (including 1 native)	1	5	4 (including 2 native)	1	7
Post Secondary Institutions	CAMOSUN COLLEGE Lansdowne Campus Carey Road Campus Interurban Campus UNIV. OF VICTORIA					
Key Industries/Cos.	Services, esp. public admin & defence. Tourism. Manufacturing: 49% of Region's establishments but accounts for only 24% of manufacturing employment. Lead manufacturing employers in 1987: MC Forest Products, Times-Colonist, Wescraft, & others. Largest sawmill: Fletcher Challenge	Logging: Fletcher Challenge main firm.	Forest industries esp. logging. Main logging firm: CIP. Largest manufacturing firm: Lanford Forest Products. Large sawmill: Sooke Sawmill (employee own'd coop).	Included with Victoria.	Included with Victoria. Also, Fletcher Challenge Seed Orchard and CIP Inc. Nursery.	Included with Victoria.
High Tech Companies (VIATC members, Jan 91)	133		3	4		27
Hospitals	Royal Jubilee, Victoria General, Gorge Road, Queen Alexandra Hosp for Child, Glendale Lodge, Juan de Fuca Hospitals, Mount St. Mary's Hospital.				Saanich Peninsula Hosp.	

Where a city is served by more than one cable company, the number of subscribers is totalled and the least number of channels provided is listed.

The following designations are used to describe means of reception: S=satellite; M=microwave; O=off air. The number following the designation refers to the number of channels available by that means. Any discrepancies between these numbers and the number of channels listed can generally be accounted for by local programming.

GEOGRAPHIC AREA	GULF ISLANDS						COMICHAN
CITY/TOWN	PULFORD HARBOUR	GALIANO ISLAND	GANGES	NATHE ISLAND	PENDER ISLAND	SATURNA ISLAND	CROFAIRUS
BC TEL							
TRANSMISSION FACILITIES							
Microwave Analog							
Microwave Digital	X	X	X		X		
SONET LTS							
Optical Fibre	1994		1994				X
Copper Digital				X		X	
EXCHANGE TYPE							
DMS							1993
GTD-5	X	1992	X	1992	X	1992	X
Other		X				X	
SERVICES							
Call Management	1992	1992	1992	1992	1992	1992	1992
Business Pac	X	1992	X	1992	X	1992	X
SMART Features	X	X	X	1992	X	1992	X
Paxcom	X	1992	X	1992	X	1992	X
WATS	X	1992	X	1992	X	1992	X
Teleplus	X	X	X	X	X	X	X
Advantage	X	X	X	X	X	X	X
800 Service	X	X	X	X	X	X	X
Remote Call Forward	X	1992	X	1992	X	1992	X
Envoy 100	X	X	X	X	X	X	X
LDET 2000	X	X	X	X	X	X	X
Traderoute	X	X	X	X	X	X	X
Teleconferencing	X	X	X	X	X	X	X
Video							
Datalink							
Datapac	X	X	X	X	X	X	X
Dataroute							
Megaroute							X
Megastream							X
ISA	X	1992	X	1992	X	1992	X
ISDN-BRA							
ISDN-PRA							
ADVOTEL Services	X	X		X	X	X	X
UNITEL							
FACILITIES							
Analog							
Digital Microwave							
Optical Fibre							
BC Tel Lease	X	X	X	X	X	X	X
SERVICES							
Paxpac							
Mach III							
Private Line (Voice)	X	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X	X
Broadband Exchange							
Facaroute							
Facaroute Plus							

GEOGRAPHIC AREA	GULF ISLANDS						COWICHAN
CITY/TOWN	PULFORD HARBOUR	GALIANO ISLAND	GANGES	MAYNE ISLAND	PENDER ISLAND	SATURNA ISLAND	CHEMAINUS
BC CELLULAR							
Class 1 Service		X		X	X	X	X
Class 2 Service	X	X	X	X	X	X	
CANTEL							
Class 1 Service	X	X	X	X	X	X	X
Class 2 Service							
BC HYDRO							
NW Circuit Termination	X						
BC Tel leased line							
CATV SYSTEMS							
Channels	10				23		
No. of Subscribers	2060				748		
Means of Reception	06/M6/35				S6/05		
Other							
PRETS GRANT RECIPIENTS		YES		YES	YES	YES	
BC SYSTEMS CORP.							
SHA							
9.6 kbps			1				
19.2 kbps			1				
56 kbps							
1.5 mbps							
DRET							
9.6 kbps							
19.2 kbps							
56 kbps							
1.5 mbps							
PROVNET PABX Trunks		1	19		3		2
BC RET							
9.6 kbps							
19.2 kbps							
56 kbps							
1.5 mbps							
ICBC							
19.2 kbps							
56 kbps							

GEOGRAPHIC AREA	GULF ISLANDS						COWICHAN
CITY/TOWN	PULPORD HARBOUR	GALIANO ISLAND	GANGES	MAYNE ISLAND	PENDER ISLAND	SATURNA ISLAND	CHEMAINUS
NOTES							
PROFILE							
Population	518	754	1133	690	1149	245	393
Number of Schools	1	1	5	1	1	1	6 (including 1 native)
Post Secondary Institutions							
Key Industries/Cos.	Tourism, self-employed artists and craftsmen. Retired.	Tourism, self-employed artists and craftsmen. Retired.	Service and retail trade centre for Gulf Islands. Tourism, self-employed artists and craftsmen. Retired.	Tourism, self-employed artists and craftsmen. Retired.	Tourism, self-employed artists and craftsmen. Retired.	Tourism, self-employed artists and craftsmen. Retired.	Forest industries. Large sawmills: Nanoose Forest Products and MacBlo. Small sawmill: Van Isle Fibre. Tourism.
High Tech Companies (VIATC members, Jan 91)	2 (Gulf Is tot)						1
Hospitals			Lady Minto Gulf Island Hospital				Chemainus Hosp. Chemainus Diagnostic and Treatment Centre.

GEOGRAPHIC AREA						
CITY/TOWN	COBBLE HILL	CROFTON	DUNCAN	LADYSMITH	MILL BAY	SHAWNIGAN LAKE
BC TEL						
TRANSMISSION FACILITIES						
Microwave Analog						
Microwave Digital						
SONET LTS			1994			
Optical Fibre	X		X	X		
Copper Digital		X			X	X
EXCHANGE TYPE						
DMS		1993	1997	1993		
GTD-5	X	X		X		X
Other			X		X	
SERVICES						
Call Management	1992	1992	1997	1992	1992	1992
Business Pac	X	X		X		X
SMART Features	X	X	X	X		
Paxcom	X	X	X	X		
WATS	X	X	X	X		
Teleplus	X	X	X	X		
Advantage	X	X	X	X		
800 Service	X	X	X	X		
Remote Call Forward	X	X	X	X		
Envoy 100	X	X	X	X		
iNET 2000	X	X	X	X		
Traderoute	X	X	X	X		
Teleconferencing	X	X	X	X		
Video						
Datalink						
Datapac	X	X	X	X		
Dataroute			X			
Megaroute			X (DS1/DS0)			
Megastream			X (Dedicated)			
ISA	X	X		X		X
ISDN-BRA			1997			
ISDN-PRA			1997			
AUTOTEL Services	X		X	X	X	X
UNITEL						
FACILITIES						
Analog			X			
Digital Microwave			X			
Optical Fibre						
BC Tel Lease	X	X		X	X	X
SERVICES						
Paspac			X			
Mach III			X			
Private Line (Voice)	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X
Broadband Exchange			X			
Facsroute			X			
Facsroute Plus			X			

GEOGRAPHIC AREA						
CITY/TOWN	COBBLE HILL	CROFTON	DUNCAN	LADYSMITH	MILL BAY	SHAWNIGAN LAKE
BC CELLULAR						
Class 1 Service			X		X	
Class 2 Service		X		X		X
CANTEL						
Class 1 Service		X	X	X	X	X
Class 2 Service						
BC HYDRO						
MW Circuit Termination			X			
BC Tel leased line				X		
CATV SYSTEMS	Note 1				Note 1	Note 1
Channels			30			
No. of Subscribers			16250			
Means of Reception			S16/M9/02			
Other			NOTE 1			
PEETS GRANT RECIPIENTS						
BC SYSTEMS CORP.						
SNA						
9.6 kbps			8			
19.2 kbps						
56 kbps						
1.5 mbps						
DNET						
9.6 kbps						
19.2 kbps			5			
56 kbps						
1.5 mbps						
PROFIT PABX Trunks	3		265	12	3	
BC NET						
9.6 kbps						
19.2 kbps						
56 kbps						
1.5 mbps						
ICBC						
19.2 kbps			X	X		
56 kbps						

GEOGRAPHIC AREA						
CITY/TOWN	COBBLE HILL	CROFTON	DUNCAN	LADYSMITH	MILL BAY	SHAWNIGAN LAKE
NOTES	1. Included in Duncan figures.		1. Cable subs. includes: North Covichan, Saltair, Quamichan, Shawnigan Lk, Cobble Hill, Mill Bay, Covichan Distr., Lake Covichan, Youbou, Misachie Lake, Honeymoon Bay, Meade Creek		1. Included in Duncan figures.	1. Included in Duncan figures.
PROFILE						
Population	497		3949	4529	590	490
Number of Schools	4	1	23 (including 2 native)	10 (including 2 native)	3	4
Post Secondary Institutions			MALASPINA COLLEGE Covichan Campus			
Key Industries/Cos.	Forest industries. Limestone mining quarry.	Forest industries. Pulp & paper mill key to all Duncan area. Fletcher Challenge largest forest manufacturing employer.	Forest industries. Main comercial centre for area. 48 manufacturing establishments in Covichan Valley District. Doman Industries head office in Duncan, sawmill at Covichan Bay. Cincor Fibres Ltd. sawmill. Koksilah Nursery.	Forest industries, mainly sawmilling and logging. Tourism. Local trade and services centre for area. Fletch Challenge timber harvesting. Two sawmills in '86: Ladysmith Forest Prod. (division of Doman) and CIP.	Forest industries.	Forest industries. Tourism.
High Tech Companies (VIATC members, Jan 91)	1		1	1		
Hospitals			Covichan District Hospital	Ladysmith and District General Hospital		

GEOGRAPHIC AREA	LAKE COWICHAN			NANAIMO			
CITY/TOWN	HONEYMOON BAY	LAKE COWICHAN	YOUBOU	CASSIDY	GABRIOLA ISLAND	LANTZVILLE	NANAIMO
BC TEL							
TRANSMISSION FACILITIES							
Microwave Analog							
Microwave Digital					X		X
SONET LTS							1994
Optical Fibre							X
Copper Digital	X	X	X	X		X	
EXCHANGE TYPE							
DMS		1992	1992	1993	1993		1993
GTD-5				X	X	X	X
Other	X	X	X				
SERVICES							
Call Management				1992	1992	1992	1992
Business Pac				X	X	X	X
SMART Features		1992	1992	1993	X	X	X
Paxcon		1992	1992			X	X
WATS		1992	1992			X	X
Teleplus		X	X	X	X	X	X
Advantage		X	X	X	X	X	X
800 Service		X	X	X	X	X	X
Remote Call Forward		1992	1992			X	X
Envoy 100		X	X	X	X	X	X
INET 2000		X	X	X	X	X	X
Traderoute		X	X	X	X	X	X
Teleconferencing		X	X	X	X	X	X
Video							
Datalink						X	X
Datapac		X	X	X	X	X	X
Dataroute						X	X
Megaroute						X	X
Megastream						X	X
ISA				X	X	X	X
ISDN-BRA							1994
ISDN-PRA							1994
AUTOTEL Services		X		X	X	X	X
UNITEL							
FACILITIES							
Analog							X
Digital Microwave							X
Optical Fibre							
BC Tel Lease	X	X	X	X	X	X	
SERVICES							
Paspac							X
Mach III							X
Private Line (Voice)	X	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X	X
Broadband Exchange							X
Pacsroute							X
Pacsroute Plus							X

GEOGRAPHIC AREA	LAKE COWICHAN			NANAIMO			
CITY/TOWN	HONEYMOON BAY	LAKE COWICHAN	YOUBOU	CASSIDY	GABRIOLA ISLAND	LANTZVILLE	NANAIMO
BC CELLULAR							
Class 1 Service				X	X	X	X
Class 2 Service							
CANTEL							
Class 1 Service				X	X	X	X
Class 2 Service							
BC HYDRO							
MW Circuit Termination							X
BC Tel leased line							
CATV SYSTEMS	Note 1	Note 1	Note 1		Note 1		
Channels							30
No. of Subscribers							27587
Means of Reception							516/N8/03
Other							See comment
PEETS GRANT RECIPIENTS			YES				
BC SYSTEMS CORP.							
SNA							
9.6 kbps							12
19.2 kbps							8
56 kbps							
1.5 mbps							
DNET							
9.6 kbps							2
19.2 kbps							15
56 kbps							1
1.5 mbps							
PROVNET PABX Trunks	1	16		7	2		120
							500 centrex lines
BC NET							
9.6 kbps							
19.2 kbps							
56 kbps							
1.5 mbps							
ICBC							
19.2 kbps		X					
56 kbps							X

GEOGRAPHIC AREA	LAKE COWICHAN			NANAIMO			
CITY/TOWN	HONEYMOON BAY	LAKE COWICHAN	YOUBOU	CASSIDY	GABRIOLA ISLAND	LADYSMITH	NANAIMO
NOTES	1. Included in Duncan figures.	1. Included in Duncan figures.	1. Included in Duncan figures.		1. Included in Nanaimo figures.		1. Cable subs. include: Nanaimo environs, Cedar, North Part of Gabriola Isl.
PROFILE							
Population	428	2083	801	547	518	1839	85361
Number of Schools	1	5	1	1	1	1 (including 1 native)	41
Post Secondary Institutions						MALASPINA COLLEGE	
Key Industries/Cos.	Forest industries. Western Forest Industries mill closed '81.	Forest industries.	Forest industries: BC Forest Products lumber manufacturing mill. Fletcher Challenge only permanent forestry operator in the area.	Forest industries. See Nanaimo.	Forest industries. See Nanaimo.	Forest industries. See Nanaimo.	Forest industries. Trade and services (2nd to Victoria), esp. Tourism. Large sawmill, pulp & paper. 60 diverse manufacturing establishments in District: major employer is MacBlo. Largest firm outside resources is S. Madill. Principal logging operators: Fletcher Challenge & MacBlo. 5 permanent sawmills in area in 1986: CIPA, Donan, MacBlo (2), and Mayo.
High Tech Companies (VIATC members, Jan 91)		1					10
Hospitals							Nanaimo Regional General Hosp.

GEOGRAPHIC AREA	QUALICUM							ALBERNI
CITY/TOWN	BOWSER	COOMBS	ERRINGTON	LASQUETI ISLAND	NANOOSE BAY	PARKSVILLE	QUALICUM BEACH	BAMFIELD
BC TEL								
TRANSMISSION FACILITIES								
Microwave Analog								
Microwave Digital				X				X
SONET LTS							1994	
Optical Fibre						X		
Copper Digital	X	X	X	X	X		X	
EXCHANGE TYPE								
DMS								
GTD-5	X	X	X		X	X	X	X
Other								
SERVICES								
Call Management	1992	1992	1992	1992	1992	1992	1992	1992
Business Pac	X	X	X		X	X	X	X
SMART Features	X	X	X	X	X	X	X	X
Faxcom	X	X	X	X	X	X	X	X
WATS	X	X	X	X	X	X	X	X
Teleplus	X	X	X	X	X	X	X	X
Advantage	X	X	X	X	X	X	X	X
800 Service	X	X	X	X	X	X	X	X
Remote Call Forward	X	X	X	X	X	X	X	X
Envoy 100	X	X	X	X	X	X	X	X
iNET 2000	X	X	X	X	X	X	X	X
Traderoute	X	X	X	X	X	X	X	X
Teleconferencing	X	X	X	X	X	X	X	X
Video								
Datalink	X				X	X		
Datapac	X				X	X	X	X
Dataroute								
Megaroute								
Megastream								
ISA	X	X	X		X	X	X	X
ISDN-BRA								
ISDN-PRA								
AUTOTEL Services	X	X	X	X	X	X	X	X
UNITEL								
FACILITIES								
Analog								
Digital Microwave								
Optical Fibre								
BC Tel Lease	X	X	X	X	X	X	X	X
SERVICES								
Paspac								
Mach III								
Private Line (Voice)	X	X	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X	X	X
Broadband Exchange								
Facsroute								
Facsroute Plus								

GEOGRAPHIC AREA	QUALICUM							ALBERNI
CITY/TOWN	BOWSER	COOMBS	ERRINGTON	LASQUETI ISLAND	BABOOSE BAY	PARKSVILLE	QUALICUM BEACH	BAMFIELD
BC CELLULAR								
Class 1 Service	X	X	X	X	X	X	X	
Class 2 Service				X				
CANTEL								
Class 1 Service	X	X	X	X	X	X	X	
Class 2 Service								
BC HYDRO								
MW Circuit Termination								
BC Tel leased line						X		
CATV SYSTEMS							Note 1	
Channels					30	30		4
No. of Subscribers					906	9672		45
Means of Reception					S16/011	S16/M8/03		S3/01
Other						See comment		
PEETS GRANT RECIPIENTS								YES
BC SYSTEMS CORP.								
SNA								
9.6 kbps								
19.2 kbps						2		
56 kbps								
1.5 mbps								
DNET								
9.6 kbps								
19.2 kbps						2		
56 kbps								
1.5 mbps								
PROVNET PABX Trunks	5				1	65	3	
BC NET								
9.6 kbps								
19.2 kbps								
56 kbps								
1.5 mbps								
ICBC								
19.2 kbps						X		
56 kbps								

GEOGRAPHIC AREA	QUALICUM							ALBERNI
CITY/TOWN	BOWSER	COOMBS	ERRINGTON	LASQUETI ISLAND	NANOOSE BAY	PARKSVILLE	QUALICUM BEACH	BAMFIELD
NOTES						1. Cable subs. include: Qualicum Beach, Dashwood, Whiskey Creek, Little Mtn.	1. Included in Parksville figure.	
PROFILE								
Population		711	841	300	421	6157	3654	
Number of Schools	1	1	1	1	1	6	4	1
Post Secondary Institutions						MALASPINA COLLEGE Parksville/Qualicum Campus		NIC Reg'l
Key Industries/Cos.	Forest industries especially logging. Tourism. MacBlo key company.	Forest industries especially logging. Tourism. MacBlo key company.	Forest industries especially logging. Tourism. MacBlo key company.		Forest industries especially logging. Tourism. MacBlo key company.	Forest industries especially logging. Tourism. MacBlo key company.	Forest industries especially logging. Tourism. MacBlo key company.	Resource industries (fishing). Tourism. (West Coast Trail).
High Tech Companies (VIATC members, Jan 91)						1	1	1
Hospitals							Trillium Extended Care Hospital	Red Cross Outpost Hospital

GEOGRAPHIC AREA					COURTENAY		
CITY/TOWN	PORT ALBERNI	TOFINO	ARROWSAT	DCLBELET	BLACK CREEK	MERVILLE	COURTENAY
BC TEL							
TRANSMISSION FACILITIES							
Microwave Analog			X				
Microwave Digital	X			X		X	
SONET LTS	1994						
Optical Fibre							X
Copper Digital		X			X		
EXCHANGE TYPE							
DMS			1996				
GTD-5	X	X		X	X	X	X
Other			X				
SERVICES							
Call Management	1992	1992		1992	1992	1992	1992
Business Pac	X	X		X		X	X
SMART Features	X	X	1996	X	X		X
Paxcon	X	X	1996	X	X		X
WATS	X	X	1996	X	X		X
Teleplus	X	X	X	X	X		X
Advantage	X	X	X	X	X		X
800 Service	X	X	X	X	X		X
Remote Call Forward	X	X		X	X		X
Envoy 100	X	X	X	X	X		X
iNET 2000	X	X	X	X	X		X
Traderoute	X	X	X	X	X		X
Teleconferencing	X	X	X	X	X		X
Video							
Datalink							
Datapac	X	X	X	X	X		X
Dataroute							
Megaroute							
Megastream							
ISA	X	X		X		X	X
ISDN-BRA							
ISDN-PRA							
AUTOTEL Services	X	X		X	X	X	X
UNITEL							
FACILITIES							
Analog							X
Digital Microwave							X
Optical Fibre							
BC Tel Lease	X	X	X	X	X	X	
SERVICES							
Paspac							X
Mach III	X						X
Private Line (Voice)	X	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X	X
Broadband Exchange							X
Facaroute							X
Facsroute Plus							X

GEOGRAPHIC AREA					COURTENAY		
CITY/TOWN	PORT ALBERNI	TOFINO	ABOUSAT	UCLUELET	BLACK CREEK	MERVILLE	COURTENAY
BC CELLULAR							
Class 1 Service					X	X	X
Class 2 Service							
CANTEL							
Class 1 Service					X	X	X
Class 2 Service							
BC HYDRO							
MW Circuit Termination							
BC Tel leased line	X						X
CATV SYSTEMS						Note 1	Note 1
Channels	30	13	3	19			
No. of Subscribers	9798	326	50	661			
Means of Reception	S17/M8/02	S14	S3	S16/02			
Other	See Comment						
PEETS GRANT RECIPIENTS		YES		YES			
BC SYSTEMS CORP.							
SHA							
9.6 kbps	2			1			5
19.2 kbps	3						4
56 kbps							
1.5 mbps							
DOET							
9.6 kbps							
19.2 kbps	3						6
56 kbps							
1.5 mbps							
PROVNET PABX Trunks	128	2		11	8		311
BC NET							
9.6 kbps							
19.2 kbps							
56 kbps							
1.5 mbps							
ICBC							
19.2 kbps	X						X
56 kbps							

GEOGRAPHIC AREA					COURTENAY		
CITY/TOWN	PORT ALBERNI	TOFINO	ABOUSAT	UCLUELET	BLACK CREEK	MERVILLE	COURTENAY
NOTES	1. Cable subs. includes all Alberni Valley and Sproat Lk					1. Included in Powell River figures.	1. Included in Powell River figures.
PROFILE							
Population	17888	933	78	1503	1972	782	9647
Number of Schools	18	2	1	2	2	2	11
Post Secondary Institutions	NIC Reg'l	NIC Reg'l	NIC Reg'l	NIC Reg'l			NIC Reg'l
Key Industries/Cos.	Forest industries. 27 manufacturing establishments in Alberni-Clayoquot Regional District. Large sawmill, pulp & paper. MacBlo, and to lesser extent, Fletcher Challenge. Mining: Westain Resources Hachtush/ STMC Resources Ltd.	Resource industries especially logging and commercial fishing. Tourism (Long Beach).		Resource industries, fishing. Tourism (Long Beach). Brynnor Mines closed 1970s.			Trade and services centre for area. Leading employers in area: Prinex, Dairyland, Edward W. Bickle. Fletcher Challenge. Agriculture in this area is the bulk for the northern half of Vancouver Island, esp. dairy and beef.
High Tech Companies (VIATC members, Jan 91)	1						4 (incl Comox)
Hospitals	West Coast General Hosp	Tofino General Hospital					

GEOGRAPHIC AREA							
CITY/TOWN	COMOX	CUMBERLAND	DENMAN ISLAND	HORNBY ISLAND	LAZO	ROYSTON	UNION BAY
BC TEL							
TRANSMISSION FACILITIES							
Microwave Analog					X		
Microwave Digital							
SONET LTS							
Optical Fibre	X						
Copper Digital		X	X	X		X	X
EXCHANGE TYPE							
DMS							
GTD-5	X	1993	1991	X	X	X	X
Other		X	X				
SERVICES							
Call Management	1992			1992	1992	1992	1992
Business Pac	X	1993	1991	X	X	X	X
SMART Features	X	1993	X	X	X	X	X
Paxcon	X	1993	X	X	X	X	X
WATS	X	1993	X	X	X	X	X
Teleplus	X	X	X	X	X	X	X
Advantage	X	X	X	X	X	X	X
800 Service	X	X	X	X	X	X	X
Remote Call Forward	X	1993	X	X	X	X	X
Envoy 100	X	X	X	X	X	X	X
IBET 2000	X	X	X	X	X	X	X
Traderoute	X	X	X	X	X	X	X
Teleconferencing	X	X	X	X	X	X	X
Video							
Datalink							
Datapac	X	X	X	X	X	X	X
Dataroute							
Megaroute							
Megastream							
ISA	X	1993	1991	X	X	X	X
ISDN-BRA							
ISDN-PRA							
AUTOTEL Services	X	X	X	X	X	X	X
UNITEL							
FACILITIES							
Analog							
Digital Microwave							
Optical Fibre							
BC Tel Lease	X	X	X	X	X	X	X
SERVICES							
Paspac							
Mach III							
Private Line (Voice)	X	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X	X
Broadband Exchange							
Pacsroute							
Pacsroute Plus							

GEOGRAPHIC AREA							
CITY/TOWN	COMOX	CUMBERLAND	DENMAN ISLAND	HORNBY ISLAND	LAZO	ROYSTON	UNION BAY
BC CELLULAR							
Class 1 Service	X				X	X	
Class 2 Service		X	X	X			X
CANTEL							
Class 1 Service	X	X	X	X	X	X	X
Class 2 Service							
BC HYDRO							
MW Circuit Termination							
BC Tel leased line							
CATV SYSTEMS	Note 1	Note 1					Note 1
Channels							
No. of Subscribers							
Means of Reception							
Other							
PEETS GRANT RECIPIENTS				YES			
BC SYSTEMS CORP.							
SNA							
9.6 kbps							
19.2 kbps	1						
56 kbps							
1.5 mbps							
DNET							
9.6 kbps							
19.2 kbps	1						
56 kbps							
1.5 mbps							
PROTHET PABX Trunks	18	3	1				1
BC NET							
9.6 kbps							
19.2 kbps							
56 kbps							
1.5 mbps							
ICBC							
19.2 kbps	X						
56 kbps							

GEOGRAPHIC AREA							
CITY/TOWN	COMOX	CUMBERLAND	DENMAN ISLAND	HORNBY ISLAND	LAZO	ROYSTON	UNION BAY
NOTES	1. Included in Powell River figures.	1. Included in Powell River figures.					1. Included in Powell River figures.
PROFILE							
Population	7403	1861	760	796		1396	557
Number of Schools	5	2	1	1	1	1	1
Post Secondary Institutions	NIC						
Key Industries/Cos.	Canadian Forces Air Base. Forest industries, especially logging. 69 manufacturing establishments in Comox-Strathcona District.	Once a mining community. Now retirement and logging centre.	Tourism, self-employed artists and craftsmen. Retired.	Tourism, self-employed artists and craftsmen. Retired.		Pole plant.	
High Tech Companies (VIATC members, Jan 91)	See Courtenay						
Hospitals	St. Joseph's General Hospital	Cumberland Health Care Facility					

GEOGRAPHIC AREA	CAMPBELL RIVER						VANCOUVER ISLAND
CITY/TOWN	CAMPBELL RIVER	NARSONS LANDING	QUATHIASKI COVE	READ ISLAND	CORTES LANDING	SAYWARD	GOLD RIVER
BC TEL							
TRANSMISSION FACILITIES							
Microwave Analog	X	X	X		X	X	X
Microwave Digital	X	1995	1995			X	1995
SONET LTS							
Optical Fibre	X						
Copper Digital							
EXCHANGE TYPE							
DMS	1994	1993			1993		
GTD-5	X		X			1995	1994
Other		X			X	X	X
SERVICES							
Call Management	1992						
Business Pac	X					1995	1994
SMART Features	X	1993			1993	1995	1994
Faxcom	X	1993			1993	1995	1994
WATS	X	1993			1993	1995	1994
Teleplus	X	X			X	X	X
Advantage	X	X			X	X	X
800 Service	X	X			X	X	X
Remote Call Forward	X				1993		1994
Envoy 100	X	X			X	X	X
INET 2000	X	X			X	X	X
Traderoute	X	X			X	X	X
Teleconferencing	X	X			X	X	X
Video							
Datalink							
Datapac	X	X			X	X	X
Dataroute	X						
Megaroute	X						
Megastream	X						
ISA	X					1995	1994
ISDN-BRA							
ISDN-PRA							
DATOTEL Services	X	X	X	X	X	X	X
DATTEL							
FACILITIES							
Analog	X						
Digital Microwave	X						
Optical Fibre							
BC Tel Lease		X	X	X	X	X	X
SERVICES							
Paxpac	X						
Mach III	X						
Private Line (Voice)	X	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X	X
Broadband Exchange	X						
Paxroute	X						
Paxroute Plus	X						

GEOGRAPHIC AREA / CITY/TOWN	COMOX	CUMBERLAND	DENMAN ISLAND	HORNBY ISLAND	LAZO	ROYSTON	UNION BAY
NOTES	1. Included in Powell River figures.	1. Included in Powell River figures.					1. Included in Powell River figures.
PROFILE							
Population	7403	1861	760	796		1396	557
Number of Schools	5	2	1	1	1	1	1
Post Secondary Institutions	NIC						
Key Industries/Cos.	Canadian Forces Air Base. Forest industries, especially logging. 69 manufacturing establishments in Comox-Strathcona District.	Once a mining community. Now retirement and logging centre.	Tourism, self-employed artists and craftsmen. Retired.	Tourism, self-employed artists and craftsmen. Retired.		Pole plant.	
High Tech Companies (VIATC members, Jan 91)	See Courtenay						
Hospitals	St. Joseph's General Hospital	Cumberland Health Care Facility					

GEOGRAPHIC AREA	CAMPBELL RIVER						VANCOUVER ISLAND
CITY/TOWN	CAMPBELL RIVER	MARSONS LANDING	QUATHIASKI COVE	READ ISLAND	CORTES LANDING	SAYWARD	GOLD RIVER
BC TEL							
TRANSMISSION FACILITIES							
Microwave Analog	X	X	X		X	X	X
Microwave Digital	X	1995	1995			X	1995
SONET LTS							
Optical Fibre	X						
Copper Digital							
EXCHANGE TYPE							
DMS	1994	1993			1993		
GTD-5	X		X			1995	1994
Other		X			X	X	X
SERVICES							
Call Management	1992						
Business Pac	X					1995	1994
SMART Features	X	1993			1993	1995	1994
Faxcom	X	1993			1993	1995	1994
WATS	X	1993			1993	1995	1994
Teleplus	X	X			X	X	X
Advantage	X	X			X	X	X
800 Service	X	X			X	X	X
Remote Call Forward	X				1993		1994
Envoy 100	X	X			X	X	X
iNET 2000	X	X			X	X	X
Traderoute	X	X			X	X	X
Teleconferencing	X	X			X	X	X
Video							
Datalink							
Datapac	X	X			X	X	X
Dataroute	X						
Megaroute	X						
Megastream	X						
ISA	X					1995	1994
ISDN-BRA							
ISDN-PRA							
UTOTEL Services	X	X	X	X	X	X	X
UNITEL							
FACILITIES							
Analog	X						
Digital Microwave	X						
Optical Fibre							
BC Tel Lease		X	X	X	X	X	X
SERVICES							
Paxpac	X						
Mach III	X						
Private Line (Voice)	X	X	X	X	X	X	X
Private Line (Data)	X	X	X	X	X	X	X
Broadband Exchange	X						
Facsroute	X						
Facsroute Plus	X						

GEOGRAPHIC AREA	CAMPBELL RIVER						VANCOUVER ISLAND
CITY/TOWN	CAMPBELL RIVER	MARSONS LANDING	QUATHIASKI COVE	READ ISLAND	CORTES LANDING	SAYWARD	GOLD RIVER
BC CELLULAR							
Class 1 Service	X	X	X	X	X		
Class 2 Service							
CANTEL							
Class 1 Service	X	X	X	X	X		
Class 2 Service							
BC HYDRO							
MW Circuit Termination	X						
BC Tel leased line							X
CATV SYSTEMS							
Channels	25					4	6
No. of Subscribers	11486					280	582
Means of Reception	S13/N8/01					04	S4/02
Other	See Comment					See Comment	
PEETS GRANT RECIPIENTS		YES			YES		
BC SYSTEMS CORP.							
SHA							
9.6 kbps	1						
19.2 kbps	4						
56 kbps							
1.5 mbps							
DMET							
9.6 kbps	1						
19.2 kbps	3						
56 kbps							
1.5 mbps							
PROVNET PABX Trunks	242					1	5
BC NET							
9.6 kbps							
19.2 kbps							
56 kbps							
1.5 mbps							
ICBC							
19.2 kbps	X						X
56 kbps							

GEOGRAPHIC AREA	CAMPBELL RIVER						VANCOUVER ISLAND
CITY/TOWN	CAMPBELL RIVER	MARSONS LANDING	QUATHIASKI COVE	READ ISLAND	CORTES LANDING	SAYWARD	GOLD RIVER
NOTES	1. Cable subs. include: Oyster Bay, Saratoga Beach, Miracle Beach					1. Cable subs. includes Kelsey Bay and Hitanat	
PROFILE							
Population	18043					398	1964
Number of Schools	22	1	2 (including 1 native)	1	1	2	2
Post Secondary Institutions	NIC Reg'l	NIC Reg'l				NIC Reg'l	NIC Reg'l
Key Industries/Cos.	Forest industries, then mining & commercial fishing. Large sawmill: Crown Forest. Fletcher Challenge pulp & paper mill. Westmin mining. Hydro electric developments. Leading trade & services centre north of Nanaimo. MacBlo, CIP, Fletcher Challenge. Thermal mine west of city.	Forest industries. See Campbell River.	Logging, commercial fishing, and mariculture.	Forest industries, logging, commercial fishing, and mariculture.	Forest industries, logging, commercial fishing, and mariculture.	Forest industries, logging, commercial fishing, and mariculture.	Forest industries, pulp & paper mill, CIP. Comma Hatchery.
High Tech Companies (VIATC members, Jan 91)	1						
Hospitals	Campbell River and District General Hospital						Gold River Health Clinic

GEOGRAPHIC AREA	WEST			VANCOUVER ISLAND NORTH				
CITY/TOWN	KYUQUOT	TAHSIS	ZEBALLOS	ALERT BAY	COAL HARBOUR	HOLBERG	PORT ALICE	PORT HARDY
BC TEL								
TRANSMISSION FACILITIES								
Microwave Analog	X	X	X	X	X	X	X	X
Microwave Digital	1995	1995	1995	X	1995	1995	1995	X
SONET LTS								
Optical Fibre								
Copper Digital								
EXCHANGE TYPE								
DMS	1996	1995	X	X		1996	1995	1997
GTD-5								
Other	X	X			X	X	X	X
SERVICES								
Call Management								
Business Pac								
SMART Features	1996	1995					1995	X
Faxcom	1996	1995					1995	X
WATS	1996	1995					1995	X
Teleplus	X	X	X	X		X	X	X
Advantage	X	X	X	X		X	X	X
800 Service	X	X	X	X		X	X	X
Remote Call Forward	X	1995					1995	X
Envoy 100	X	X	X	X		X	X	X
INET 2000	X	X	X	X		X	X	X
Traderoute	X	X	X	X		X	X	X
Teleconferencing	X	X	X	X		X	X	X
Video								
Datalink								
Datapac		X	X	X		X	X	X
Dataroute								
Megaroute								
Megastream								
ISA								
ISDN-BRA								
ISDN-PRA								
AUTOTEL Services				X	X	X	X	X
UNITEL								
FACILITIES								
Analog								
Digital Microwave								
Optical Fibre								
BC Tel Lease	X	X	X	X	X	X	X	X
SERVICES								
Paspac								
Mach III								
Private Line (Voice)	X	X	X					X
Private Line (Data)	X	X	X					X
Broadband Exchange								X
Pacsroute								
Pacsroute Plus								

GEOGRAPHIC AREA	WEST			VANCOUVER ISLAND NORTH				
CITY/TOWN	KYUQUOT	TAHSIS	ZEBALLOS	ALERT BAY	COAL HARBOUR	BOLBERG	PORT ALICE	PORT HARDY
BC CELLULAR								
Class 1 Service								
Class 2 Service								
CANTEL								
Class 1 Service								
Class 2 Service								
BC HYDRO								
MW Circuit Termination								
BC Tel leased line								X
CATV SYSTEMS								
Channels		6	6	17	7	11	18	21
No. of Subscribers		320	64	321	95	143	449	1591
Means of Reception		S5/01	S6	S14/02	S5/02	S9/02	S17	S17/02
Other						See Comment		
PEETS GRANT RECIPIENTS		YES						
BC SYSTEMS CORP.								
SNA								
9.6 kbps								
19.2 kbps								2
56 kbps								
1.5 mbps								
DNET								
9.6 kbps								
19.2 kbps								
56 kbps								
1.5 mbps								
PROVNET PABX Trunks		3	2	4			4	39
BC NET								
9.6 kbps								
19.2 kbps								
56 kbps								
1.5 mbps								
ICBC								
19.2 kbps							X	X
56 kbps								

GEOGRAPHIC AREA	WEST			VANCOUVER ISLAND NORTH				
CITY/TOWN	KYUQUOT	TAHSIS	ZEBALLOS	ALERT BAY	COAL HARBOUR	HOLBERG	PORT ALICE	PORT HARDY
NOTES						1. Cable subs includes San Josef.		
PROFILE								
Population	89	1098	189	680	352	355	1360	4945
Number of Schools	1	1	1	3 (including 1 native)	1	1	1	7 (including 1 native)
Post Secondary Institutions	NIC Reg'l	NIC Reg'l	NIC Reg'l	NIC Reg'l			NIC Reg'l	NIC Reg'l
Key Industries/Cos.		Forest industries. Large sawmill (CIP).	Forest industries. Gold mining in past.	Commercial fishing. 3 manufacturing firms: boat building, and fish processing (2). Logging in area by Fletcher Challenge and MacBlo).	Forest industries, especially logging. Shake and shingle mill.	Forest industries, especially logging. Weston Forest Products.	Forest industries. Pulp & paper mill: Western Pulp Ltd. Partnership.	Mining (Island Copper Mine/BHP Utah Ltd.). Foresty (MacBlo). Restructuring of economy needed with mine resources near exhaustion.
High Tech Companies (VIATC members, Jan 91)								
Hospitals	Red Cross Outpost Hospital	Tahsis Hospital		St. George's Hosp.		Canadian Forces Station Hosp.	Port Alice Hospital	Port Hardy Hospital

GEOGRAPHIC AREA						POWELL RIVER		
CITY/TOWN	PORT MCNEILL	SIMOOM	KINGCOME INLET	SOINTULA	WOSS	KELLY CREEK	LUND	POWELL RIVER
BC TEL								
TRANSMISSION FACILITIES								
Microwave Analog	X			X	X			
Microwave Digital	X			X	1995			
SONET LTS								
Optical Fibre						X		X
Copper Digital							X	
EXCHANGE TYPE								
DMS	X			X	1996	X		
GTD-5							X	X
Other					X			
SERVICES								
Call Management							X	X
Business Pac								X
SMART Features					1996		X	X
Faxcom					1996		X	X
WATS					1996		X	X
Teleplus	X			X	X		X	X
Advantage	X			X	X		X	X
800 Service	X			X	X		X	X
Remote Call Forward					1996		X	X
Envoy 100	X			X	X		X	X
INET 2000	X			X	X		X	X
Traderoute	X			X	X		X	X
Teleconferencing	X			X	X		X	X
Video								
Datalink								
Datapac	X			X	X		X	X
Dataroute								
Megaroute								
Megastream								
ISA							X	X
ISDN-BRA								
ISDN-PRA								
AUTOTEL Services	X	X	X	X	X	X	X	X
UNITEL								
FACILITIES								
Analog								
Digital Microwave								
Optical Fibre								
BC Tel Lease	X	X		X	X	X	X	X
SERVICES								
Fastpac								
Mach III								
Private Line (Voice)	X			X	X	X	X	X
Private Line (Data)	X			X	X	X	X	X
Broadband Exchange								
Facsroute								
Facsroute Plus								

GEOGRAPHIC AREA						POWELL RIVER		
CITY/TOWN	PORT MCNEILL	SIMOON	KINCOME INLET	SOINTULA	NOSS	KELLY CREEK	LUND	POWELL RIVER
BC CELLULAR								
Class 1 Service						X		X
Class 2 Service							X	
CANTEL								
Class 1 Service						X	X	X
Class 2 Service								
BC HYDRO								
NW Circuit Termination								
BC Tel leased line								X
CATV SYSTEMS								
Channels	20			16				34
No. of Subscribers	839			151				19840
Means of Reception	S17/02			S14/01				S22/86/03
Other								See Comment
PEETS GRANT RECIPIENTS								
BC SYSTEMS CORP.								
SNA								
9.6 kbps	1							2
19.2 kbps								
56 kbps								
1.5 mbps								
DDET								
9.6 kbps	1							
19.2 kbps								
56 kbps								1
1.5 mbps								
PROVNET PABX Trunks	21			2				71
BC NET								
9.6 kbps								
19.2 kbps								
56 kbps								
1.5 mbps								
ICBC								
19.2 kbps	X							
56 kbps								

GEOGRAPHIC AREA						POWELL RIVER		
CITY/TOWN	PORT MCNEILL	SIMOON	KINGCOME INLET	SOINTULA	HOSS	KELLY CREEK	LUND	POWELL RIVER
NOTES								1. Cable subs. include: Courtenay, Comox, Cumberland, Comox Valley, Union Bay, Little River, Fanny Bay, Merville
PROFILE								
Population	2455			1000	469			12177
Number of Schools	4	1	1 native	1	1	1	1	11 (including 1 native)
Post Secondary Institutions	NIC Reg'l			NIC Reg'l	NIC Reg'l			MALASPINA COLLEGE Pow. Rvr Campus
Key Industries/Cos.				Commercial fishing.	Forest industries, especially logging.			Forest industries, pulp & paper mill (MacBlo) largest employer. 15 manufacturing establishments in Powell River Regional District.
High Tech Companies (VIATC members, Jan 91)								
Hospitals	Port MacNeill and District Hospital							Powell River General Hospital

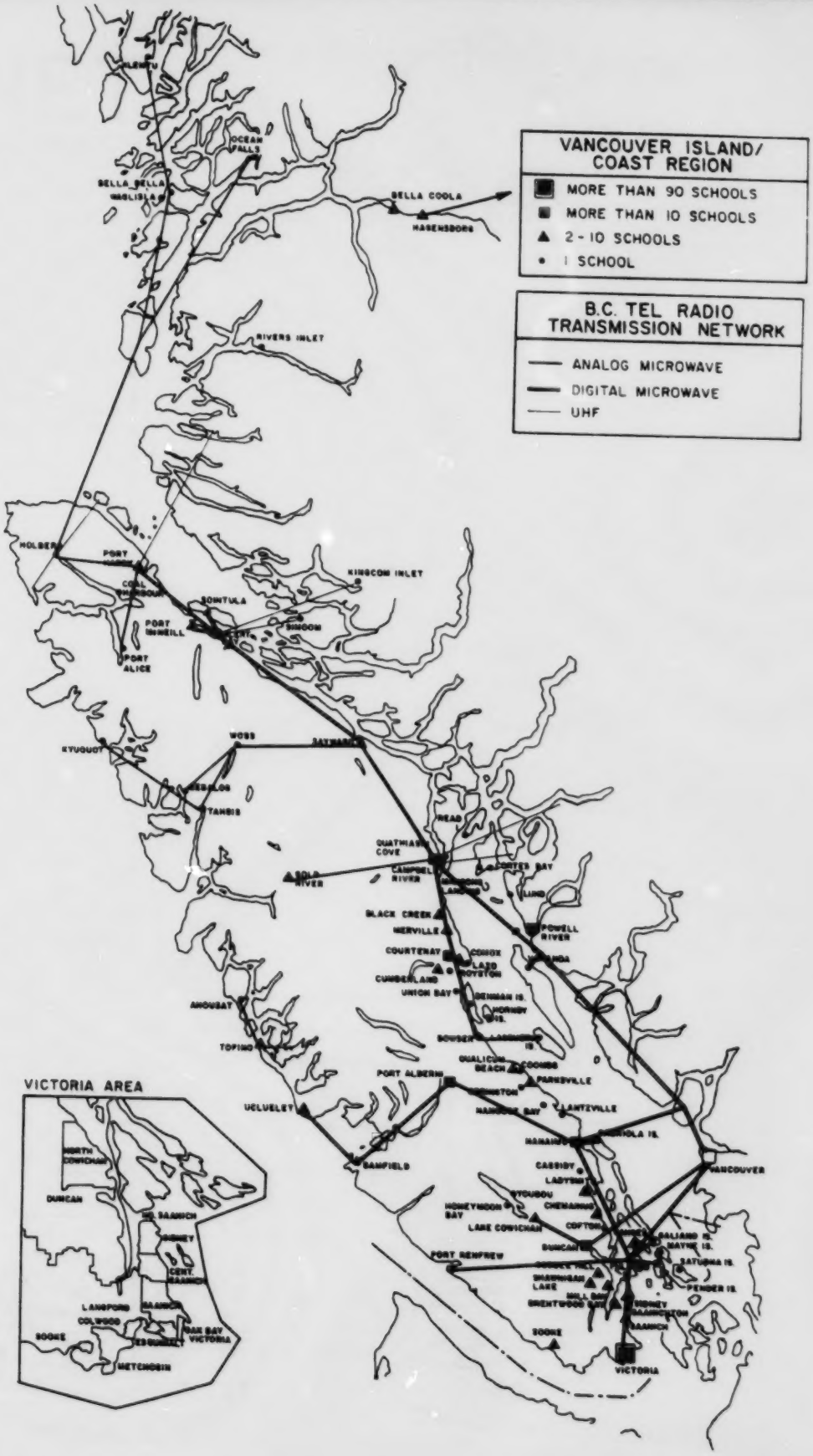
GEOGRAPHIC AREA		CENTRAL COAST						
CITY/TOWN	YARANDA	BELLA BELLA	WAGLISLA	BELLA COOLA	HAGENSBORG	OCEAN FALLS	KLEMTU	RIVERS INLET
BC TEL								
TRANSMISSION FACILITIES								
Microwave Analog		X	X		X	X	X	X
Microwave Digital	X	1995	1995		1995	1995		
SONET LTS								
Optical Fibre								
Copper Digital				X				
EXCHANGE TYPE								
DMS		1996	1996			X	X	
GTD-5								
Other	X	X	X	X	X			
SERVICES								
Call Management								
Business Pac								
SMART Features						X		
Paxcom								
WATS								
Teleplus	X	X	X	X	X	X	X	
Advantage	X	X	X	X	X	X	X	
800 Service	X	X	X	X	X	X	X	
Remote Call Forward						X		
Envoy 100	X	X	X	X	X	X	X	
INET 2000	X	X	X	X	X	X	X	
Traderoute	X	X	X	X	X	X	X	
Teleconferencing	X	X	X	X	X	X	X	
Video								
Datalink								
Datapac	X	X	X	X	X	X	X	
Dataroute								
Megaroute								
Megastream								
ISA								
ISDN-BRA								
ISDN-PRA								
ABTOTEL Services	X							
UNITEL								
FACILITIES								
Analog								
Digital Microwave								
Optical Fibre								
BC Tel Lease	X	X		X	X	X		X
SERVICES								
Paspac								
Mach III								
Private Line (Voice)	X	X		X	X	X		X
Private Line (Data)	X	X		X	X	X		X
Broadband Exchange								
Pacsroute								
Pacsroute Plus								

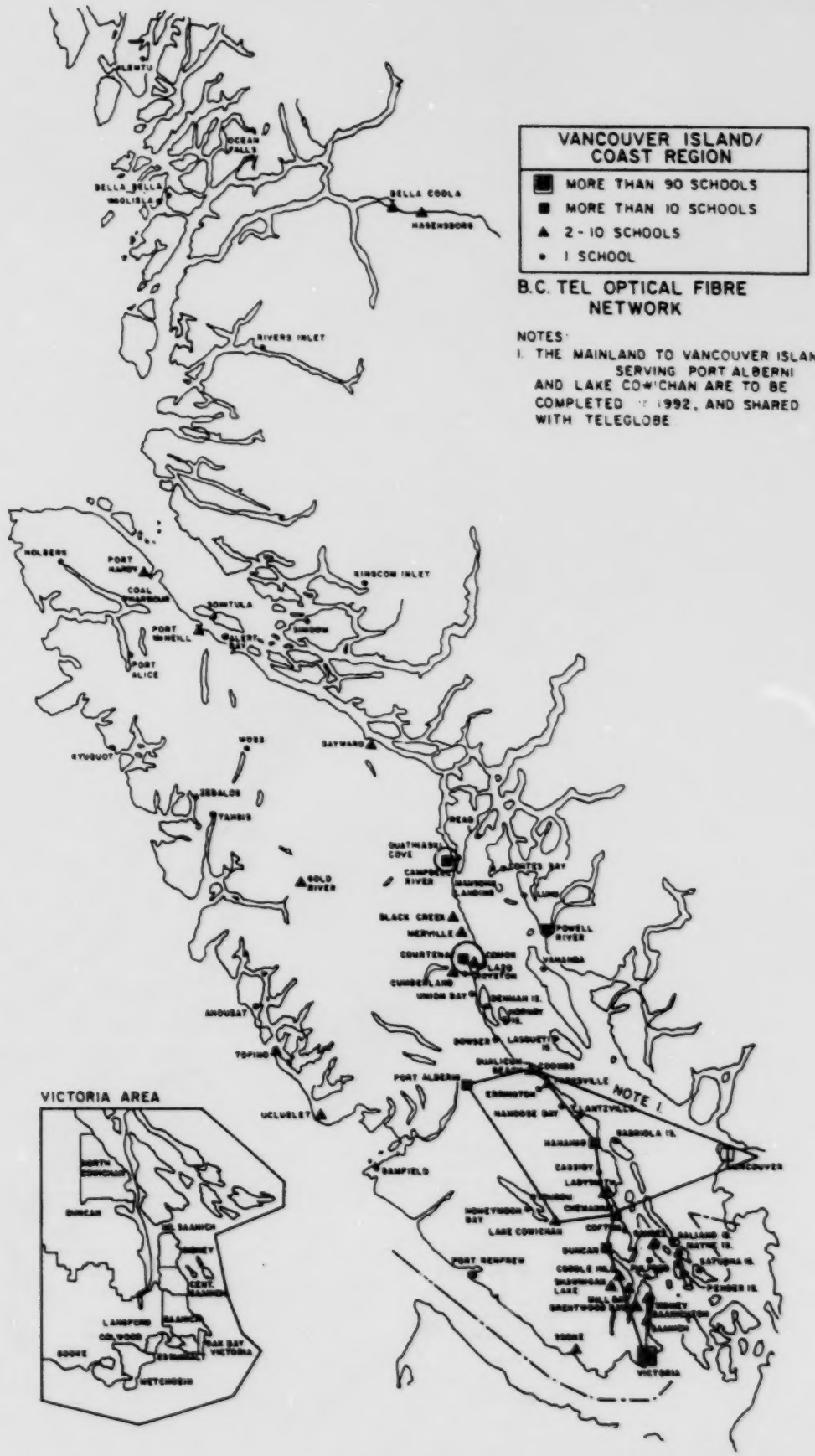
GEOGRAPHIC AREA		CENTRAL COAST						
CITY/TOWN	VANANDA	BELLA BELLA	WAGLISLA	BELLA COOLA	HAGENSBORG	OCEAN FALLS	KLEMTU	RIVERS INLET
BC CELLULAR								
Class 1 Service	X							
Class 2 Service								
CANTEL								
Class 1 Service								
Class 2 Service	X							
BC HYDRO								
MW Circuit Termination								
BC Tel leased line				X				
CATV SYSTEMS								
Channels	11	4	6	14		4	5	
No. of Subscribers	135	173	48	110		24	48	
Means of Reception	S5/05	S3	S6	S12/01		S4	S4/01	
Other								
PEETS GRANT RECIPIENTS	YES			YES (2)	YES	YES		
BC SYSTEMS CORP.								
SNA								
9.6 kbps				1	1			
19.2 kbps								
56 kbps								
1.5 mbps								
DNET								
9.6 kbps					1			
19.2 kbps								
56 kbps								
1.5 mbps								
PROVNET PABX Trunks		2		28	7			
BC NET								
9.6 kbps								
19.2 kbps								
56 kbps								
1.5 mbps								
ICBC								
19.2 kbps								
56 kbps								

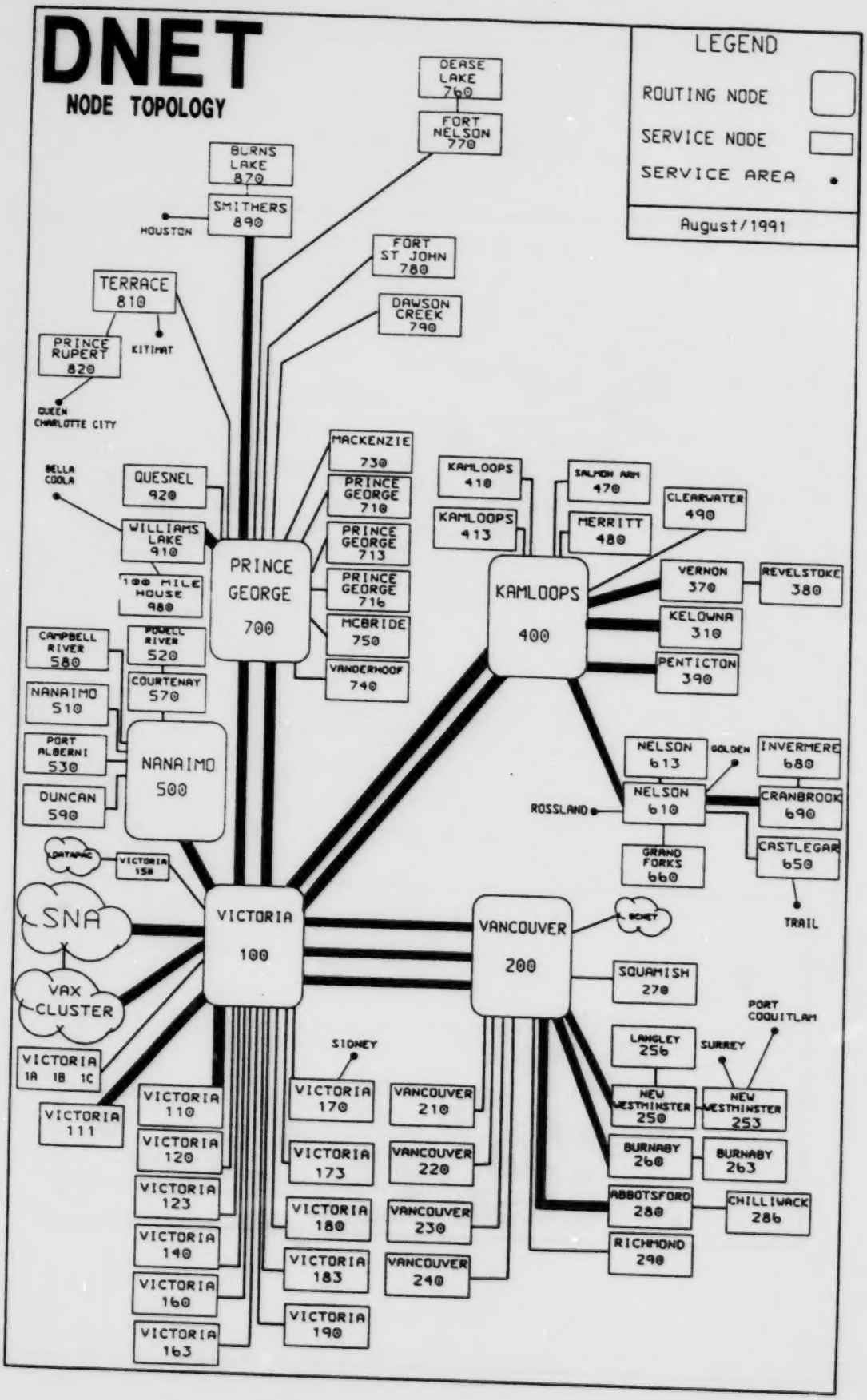
GEOGRAPHIC AREA		CENTRAL COAST						
CITY/TOWN	YARANDA	BELLA BELLA	WAGLISLA	BELLA COOLA	HAGENSBORG	OCEAN FALLS	KLEMTU	RIVERS INLET
NOTES								
PROFILE								
Population	304	875		583	559	12		527
Number of Schools	1	1	1 native	4 (including 2 native)	3	1	1 native	1
Post Secondary Institutions				BIC Reg'l				
Key Industries/Cos.	Mining, Texada Island, Texada Mines Ltd.	Central Coast Power Corp., (hydro electricity).	Logging and fishing.	Foresty and some agriculture (limited).	Logging.	Fishing and logging (Mac Blo and Western Forest Prod. main in area). Ocean Falls Pulp & Paper Mill of Ocean Falls Corp. closed 1980.		
High Tech Companies (VIATC members, Jan 91)								
Hospitals			R.W. Large Memorial Hospital	Bella Coola General Hospital				

APPENDIX B2

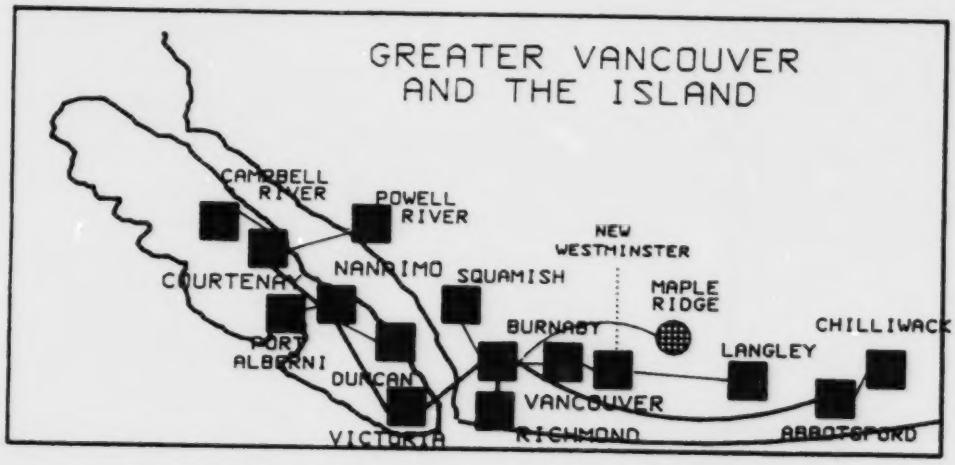
NETWORK INFRASTRUCTURES


VANCOUVER ISLAND/
COAST REGION
MORE THAN 90 SCHOOLS
MORE THAN 10 SCHOOLS
2 - 10 SCHOOLS
1 SCHOOL
B.C. TEL RADIO
TRANSMISSION NETWORK
ANALOG MICROWAVE
DIGITAL MICROWAVE
UHF
VICTORIA AREA
OCEAN FALLS
BELLA BELLA
BELLA COOLA
HAGENSBORG
RIVERS INLET
KINGCOM INLET
HOLBERG
PORT HARDY
COAL HARBOUR
SOINTULA
PORT McNEILL
PORT ALICE
KYUQUOT
WOSS
ZEBALLOS
TAHSIS
READ
QUATHIASKI COVE
CAMPBELL RIVER
COMOX
COURTENAY
CUMBERLAND
UNION BAY
DENMAN IS.
HORNBY IS.
ANOUSAT
TOFINO
UCLUELET
PORT ALBERNI
QUALICUM BEACH
PARKSVILLE
LANTZVILLE
NANAIMO
GABRIOLA IS.
BAMFIELD
CASSIDY
LADYSMITH
YOUBOU
CHEMAINUS
HONEYMOON BAY
LAKE COWICHAN
COBBLE HILL
DUNCAN
PORT RENFREW
SHAWNIGAN LAKE
MILL BAY
BRENTWOOD BAY
SOOKE
VICTORIA
VANCOUVER
GALIANO IS.
MAYNE IS.
SATURNA IS.
PENDER IS.
SIDNEY
SAANICH
NORTH COWICHAN
DUNCAN
SAANICH
SIDNEY
CENTRAL SAANICH
LANGFORD
SAANICH
COLWOOD
SOOKE
ESQUIMALT
VICTORIA
METCHOSIN

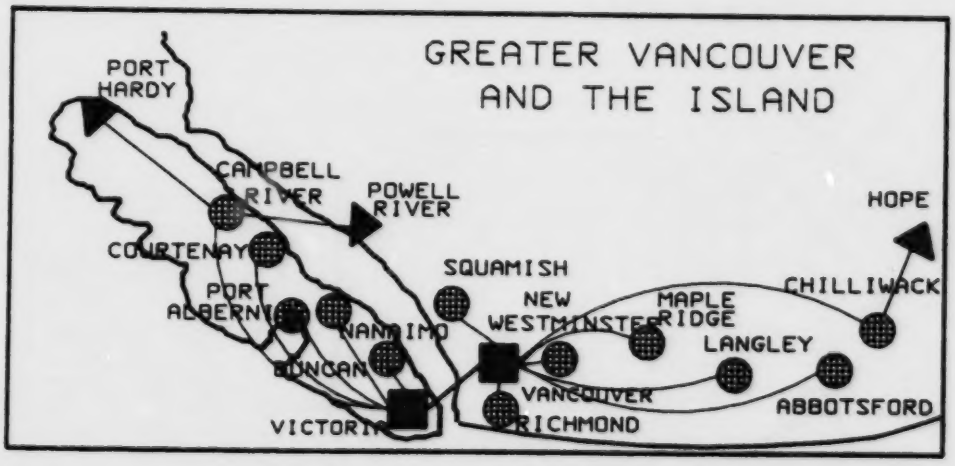

VANCOUVER ISLAND/
COAST REGION
MORE THAN 90 SCHOOLS
MORE THAN 10 SCHOOLS
2 - 10 SCHOOLS
1 SCHOOL
B.C. TEL OPTICAL FIBRE
NETWORK
NOTES:
1. THE MAINLAND TO VANCOUVER ISLAND
SERVING PORT ALBERNI
AND LAKE COWICHAN ARE TO BE
COMPLETED IN 1992, AND SHARED
WITH TELEGLOBE
VICTORIA AREA
NOTE 1
BELLA COOLA
HAGENSBORG
RIVERS INLET
KINGCOME INLET
HOLBERG
PORT ALICE
WOSS
SAYWARD
ZEBALOS
TAHSIS
SOLD RIVER
BLACK CREEK
MERVILLE
COURTENAY
COMOX
CAMPBELL RIVER
QUATHIASKI COVE
POWELL RIVER
CUMBERLAND
UNION BAY
ANDUSAT
TOFINO
UCLUELET
PORT ALBERNI
COMOX
NANOOSE BAY
LANTZVILLE
NANAIMO
GABRIOLA IS.
GALIANO IS.
SATURNA IS.
PENDER IS.
CHEMAINUS
LAKE COWICHAN
DUNCAN
PORT RENFREW
SOOKE
VICTORIA
VICTORIA AREA
DUNCAN
MT. NEWTON
CENT. SAANICH
SIDNEY
LANGFORD
COLWOOD
SOOKE
METCHOSIN
SAANICH
ESQUIMALT
OAK BAY
VICTORIA


DNET
NODE TOPOLOGY
LEGEND
ROUTING NODE
SERVICE NODE
SERVICE AREA
August/1991
DEASE LAKE 760
FORT NELSON 770
BURNS LAKE 870
SMITHERS 890
HOUSTON
FORT ST JOHN 780
DAWSON CREEK 790
TERRACE 810
KITIMAT
PRINCE RUPERT 820
QUEEN CHARLOTTE CITY
BELLA COOLA
QUESNEL 920
WILLIAMS LAKE 910
100 MILE HOUSE 980
MACKENZIE 730
PRINCE GEORGE 710
PRINCE GEORGE 713
PRINCE GEORGE 716
MCBRIDE 750
VANDERHOOF 740
PRINCE GEORGE 700
KAMLOOPS 410
KAMLOOPS 413
SALMON ARM 470
MERRITT 480
CLEARWATER 490
VERNON 370
REVELSTOKE 380
KELOWNA 310
PENTICTON 390
KAMLOOPS 400
CAMPBELL RIVER 580
POWELL RIVER 520
COURTENAY 570
NANAIMO 510
PORT ALBERNI 530
DUNCAN 590
NANAIMO 500
LADYSMITH
VICTORIA 150
NELSON 613
GOLDEN
INVERMERE 680
NELSON 610
ROSSLAND
CRANBROOK 690
CASTLEGAR 650
GRAND FORKS 660
TRAIL
SNA
VAX CLUSTER
VICTORIA 1A 1B 1C
VICTORIA 111
VICTORIA 110
VICTORIA 120
VICTORIA 123
VICTORIA 140
VICTORIA 160
VICTORIA 163
VICTORIA 100
SIDNEY
VICTORIA 170
VICTORIA 173
VICTORIA 180
VICTORIA 183
VICTORIA 190
VANCOUVER 210
VANCOUVER 220
VANCOUVER 230
VANCOUVER 240
VANCOUVER 200
BCNET
SQUAMISH 270
LANGLEY 256
SURREY
PORT COQUITLAM
NEW WESTMINSTER 250
NEW WESTMINSTER 253
BURNABY 260
BURNABY 263
ABBOTSFORD 280
CHILLIWACK 286
RICHMOND 290

SNA


GREATER VANCOUVER
AND THE ISLAND
CAMPBELL RIVER
POWELL RIVER
NEW WESTMINSTER
NANAIMO
SQUAMISH
COURTENAY
MAPLE RIDGE
BURNABY
CHILLIWACK
PORT ALBERNI
LANGLEY
DUNCAN
VANCOUVER
VICTORIA
RICHMOND
ABBOTSFORD

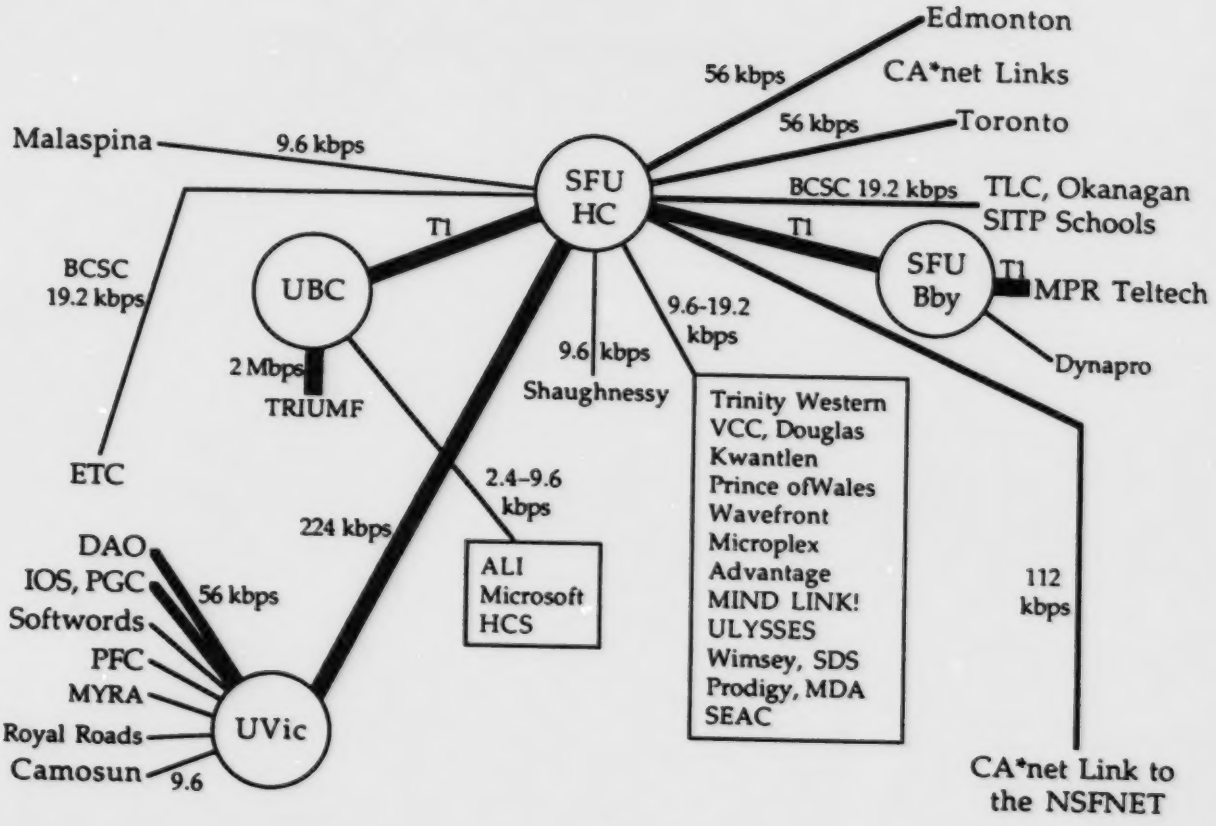
DNET


GREATER VANCOUVER
AND THE ISLAND
PORT HARDY
CAMPBELL RIVER
POWELL RIVER
HOPE
COURTENAY
SQUAMISH
CHILLIWACK
PORT ALBERNI
NEW WESTMINSTER
MAPLE RIDGE
NANAIMO
LANGLEY
DUNCAN
VANCOUVER
ABBOTSFORD
VICTORIA
RICHMOND

BCnet

Current Configuration

Dec 3, 1991



APPENDIX C1

USER SURVEY INTERVIEW LISTING

APPENDIX C1: USER SURVEY INTERVIEW LISTING

EDUCATION	Jerry Mussio	Education Technology Centre
	Steve Gray	School Board - Vancouver Island North
	John Vey	School Board - Campbell River
	Bill Sherwood	School Board - Courtenay
	Bruce Wood	School Board - Victoria
	Kathleen Forsyth	School Board - Victoria
ADVANCED EDUCATION AND TRAINING	Ron Woodward	Ministry - ADM Technology
	Chris Wehrfritz	Ministry of Advanced Educ.
	Salen Greer	Ministry of Advanced Educ.
	Frank Bessier	Ministry of Advanced Educ.
	Keith Bateman	Camosun College
	Lou Dryden	Camosun College
	David Southern	Camosun College
	Thorne Won	North Island College
	Ann Steblyk	Malaspina College
	David Godfrey	Softwords
	Betty Mitchell	OLA - Telecoms
HEALTH/ MEDICINE	Paul Thiel	MPR Teltech
	Bob Eloff	Upper Island Health Unit
	Gerhard Brauer	UVic - Health Inf. Science
	Paul Fisher	UVic - Health Inf. Science
	Frances Lasser	BC Science Council
	Bill Thompson	Sierra Systems Consultants
RESEARCH	Andy Woodsworth	Dominion Astrophysical Observ.
	Eric Manning	UVic - Engineering
	Peter Driesen	UVic - Engineering
	Mike Volker	Advanced Technology Institute
	Tom Mitchell	SPIRIT Corporation
	Andrew Wood	AXYS (Seakem)
	Mark Stone	Stone Microsystems
	Wolfgang Strigel	BC Science Council

MANUF. & OTHER INDUSTRIES	Bill Cave	Forest Tech Systems
	Terry Daniels	Daniels Electronics
	Gail Gabel	Aanderaa Instruments
	Jim Spencer	Digital Resources, Nanaimo
	Ross Johnson	Gandalf Data Ltd., Victoria
	Philip Scott	IVL Technologies
	Brent Diakow	Oceanus Re-inforced Plastics
	Mike Muirhead	Western Subsea
	Barry Ridgewell	SPIRIT Corporation
	Gary Sedun	Automation Systems Associates
	Ted Button	HTS Hi-Tech Systems
	Mr. St Cyr	Field Sawmills, Courtenay
LIBRARIES	Nancy Hannum	BC Library Association
	Lynn Copeland	SFU - Systems Librarian
	Carol Lunau	National Library of Canada
	Curt Smecher	MPR Teltech
	Linda Johnston	DOC, Pacific Region
	Jim Loonie	Library Services Branch, Min. of Mun. Affairs, Rec. & Culture
	Mary Magrega	Vancouver Island Reg. Library
	Bob McDonald	Electronic Library Network, Open Learning Agency
	Marnie Swanson	UVic Library
GOVERNMENT SERVICES	Ted Evans	BC Systems Corporation
	Chris Slade	BC Systems Corporation
	Dave Collisson	BC Purchasing Commission
	Peter Clark	Min. of Gov't Services
	Marcis Esmits	BC Trade Dev. Corporation
	Gary Sawayama	Min. of Crown Lands
	Malcolm McAvity	Land Titles Office
RESOURCE INDUSTRIES	Scott Aikenhead	Inst. of Ocean Sciences
	Darryl Hawkins	BC Min. of Forests
	Pam Sallaway	PAMAP
	Bob Lees	MacMillan Bloedel
	Brad Whithead	MacMillan Bloedel
	Chris Brown	Utah Mines

TOURISM	Richard Lemon	Min. of Devel, Trade & Tourism
	Gail Dennison	Min. of Devel, Trade & Tourism
	Irv Chamney	Kingfisher Inn, Courtenay
	Larry Eade	Oak Bay Marine Group
	Bayne Mann	Arbutus Hotel, Courtenay
	Bashir Khalasami	Bayside Hotel, Parksville
	Julio Mazzocchi	Coast Bastion Hotel
	Peter Wickham	Coast Hotels, Head Office
	Jan Douglas	Coast Hotel, Gold River
	Michael Carson	Rider Travel Services
OTHER SERVICES	Don Gardiner	Van. Is. Real Estate Board
	Steve Cochrane	Comox Valley Insurance
	Lindsay Thompson	Lindsay Office Supplies
	Richard Parker	North Island Telephone
	Brian Small	Victoria Chamber of Commerce
	Joel Rosenburg	Pacific Coast Savings
	Paul Vroom	Aquatic Seafoods
	Ellen Pawlina	Comox Valley Chamber of Commerce
	Walt Lengerke	Comox Vallley Economic Development Commission

LIST OF MAJOR RESOURCES

APPENDIX C2: LIST OF MAJOR RESOURCES

1. *Sharing Health Information: Who's Doing it and Why.* Report by Jenny Karin for SPARK Health Information Pilot Project Subcommittee, August 30, 1991.

2. *The 1991 Educational Technology Inventory: An Assessment of the Current Status at BC Colleges and Institutes.* Report for the Standing Committee on Educational Technology, May, 1991.

3. *Government of British Columbia Land Information Infrastructure*
   - *Statement of Requirements (High Level)*
   - *High Level Design*
   - *Target System and Migration Strategy*

   Reports by MacDonald Dettwiler, dated 1991.

APPENDIX C3

USER QUESTIONNAIRE SHORT FORM

Organisation		Sector
Contact	Title	Tel
Telecommunications services currently used		Network application
Most important business/telecommunications destinations		Specify from which sites
Use description (eg. file transfer, enquiries, graphics, etc.)		Speed & bandwidth req't
Satisfaction/problems with services		Service
Knowledge of alternate service providers, relative costs, etc.		Decision basis
Is choice of location influenced by telecoms availability & cost?		
Awareness of new developments in telecommunications offerings		Application/use
Future demand/projects & need for faster, enhanced services		
Prompted response to specific service offerings		- SMART features - E Mail - teleworking - conferencing - electronic transactions - image/video/graphics - access to Gov't/market information
Ideas & views on new policy initiatives		

APPENDIX D1

TABLE OF STRATEGIC INITIATIVES

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
EUROPE European Community (VENUS)	Implementation of a high speed data network for the academic community.	VENUS consists of a central backbone with regional networks and supporting networks to be used for specific disciplines. From 200 to 500 sites across Europe to be served from 20 to 40 nodes. Initial network speed is set at 2 Mbps, with a phased improvement in network speeds to 100 Mbps in a few years, and gigabit speeds by the end of the century.	Initial costs slated to be $6 million annually in the near future, rising to $24-$30 million later. The proposal has been delayed for budgetary reasons. The actors involved are still discussing the likely cost and their ability to pay.		This network was proposed in 1989 in a report to the EEC by RARE, the European body for coordinating national academic networks. The initiative is still at the proposal stage. It is currently competing with three other proposals under study by the EEC. Though proposed by the academic community, the Commission is trying to expand the proposal to include member state governments and the Commission itself. The other two proposals have been submitted by groups of member states. One (France, Germany and the UK) is for a "Super X 25" network. The other (all other states) is for TDM High Speed.
EUROPE European Community (DELTA, AIM AND DRIVE) 1991 to 1994.	Combined, DELTA, AIM and DRIVE (see below) are a research and technological development program. It consists of projects in the field of telematic systems in areas of general interest to the EC.			The activities surrounding all three initiatives concentrate on providing interoperability between national telematic systems. This involves as well defining standards, architectures and functional specifications. User acceptance, security and privacy are prime issues.	
EUROPE European Community DELTA	An initiative to provide flexible and distance learning opportunities.	As part of a collaborative effort with other EC activities such as COMETT and EUROTECNET, DELTA is split into three phases: ■ the creation of implementation strategies ■ the development of technologies and systems, and ■ the validation and integration of services. Applications currently under study include the production methods for multimedia educational materials. These will be evaluated with hopes of international use. Particular emphasis is on system portability, efficiency and cost.	ECU 54.4 million.		
EUROPE European Community AIM (Advanced Informatics in Medicine)	The objective is to stimulate the development of harmonized applications of information and communication technologies in the field of health care, and also the development of a European health care information infrastructure.	Activities for this initiative reflect those of the combined DELTA, AIM, DRIVE initiative: interoperability of national systems, the establishment of standards, user acceptability, data integrity and confidentiality. The complete choice of activities is determined by input from the European health care and telematics sectors. Specific areas under consideration include, for example, standards for alphanumeric data, text coding, images and biosignals, modularity and integration of medical and health information systems, and technologies and services for the handicapped and elderly.	ECU 124 million.		

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
EUROPE European Community DRIVE (Dedicated Road Infrastructure for Vehicle Safety in Europe)	The objective is to contribute to the development of a framework in which advanced IT and communications can be harnessed to improve the efficiency and safety of passenger and goods transport, and to reduce their impact on the environment. The project will work closely with EUREKA initiatives.	Work will cover the interface between road and rail transport, as well as between road and sea transport. Initiatives will concentrate on the needs of users, safety, provision and maintenance of infrastructure and provision of transport services.	ECU 124 million		To date, the needs specific to road transport, and the technologies and systems available for communications and traffic control, have been identified and evaluated through DRIVE and relevant EUREKA projects. There are some 70 transnational R&D projects currently under way as part of a 36 month exploratory action.
EUROPE European Community SPRINT (Strategic Program for Innovation and Technology Transfer) Launched at the end of 1983.	SPRINT was developed as "the plan for the transnational development of the supporting infrastructure for innovation and technology transfer". Its main aim is to help improve competitiveness of industry within the Community by setting up an infrastructure allowing technology and aids to innovation to be shared across national boundaries.		The first two phases of the program were completed at the end of 1988 at a cost of ECU 19 million. The third phase will run to 1994.	SPRINT is open to all organisations, both public and private, whose activities include helping businesses to exchange technology and develop innovative projects. These include, for example, regional development agencies and research consultancies.	SPRINT is a shared cost program, particularly targeted at helping small and medium sized enterprises (SMEs). The Luxembourg base of the EC is responsible for management of the program. It is assisted by the Consultative Committee for Innovation and Technology Transfer (CIT).
EUROPE European Community IMPACT (Program on Information Market Policy Actions)	To study and undertake projects that cover information market policy in specialised areas such as tourism information, image banks and intelligent interfaces.	IMPACT 2 is a program set to run between 1991 and 1995. It has four primary objectives: ■ improve the understanding of the information market (through statistical and user surveys), ■ overcome legal and administrative barriers, ■ increase user friendliness and improve information literacy, and ■ support strategic information initiatives.			IMPACT falls under the jurisdiction of the EC in Luxembourg.

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
EUROPE European Community (RACE)	Implementation of an integrated broadband communications network (IBCN) for general commercial service.	RACE is now entering into its second phase. Evolutionary model developing in the following steps: ■ linking the EC's capital cities by 1994 using a combination of overlay and existing fibre optic networks ■ substantial provision of customer access links, to at least 10,000 corporate customers, in the major business centres of the EC by 1995 ■ offering of basic transmission capacity by 1996 (two, 45, 144 Mbps) ■ interconnection with other networks by 1996 ■ provision of business customer access in towns with population of 500,000 and above by 1997.	Range from about ECU 100 billion for a 10 year period (1995-2005), actual costs depending on the reach of the network.	Private funding and protocol standardisation are now seen as key to further support of broadband R&D. The EC's program is working towards developing Open Network Provision (ONP) rules allowing fair competition over the network. This will effect development of all types of telecoms services. Under ONP, tariffs are to be 'cost related', not 'cost based', a change which may return some flexibility to telecoms operators. As RACE progresses, there is pressure to resolve policy issues holding back broadband. One report suggests cooperation in developing and using integrated broadband facilities for both telecoms and entertainment including HDTV, using private sector investments. Policies encouraging competition and shorter term investment horizons, work against industrial and technology policy.	Like STAR (below), RACE is part of the EC's telecommunications plan. It is a development program for the technologies required in the long term for the establishment of the future broadband networks. It seeks to overcome fragmentation and duplication of research and development, by initiating a pre-competitive research program (RACE) at a European level. Education is needed to instill in users the possibilities provided by high speed networks. Related activities include plans to establish a European Institute for Research and Strategic Studies in Telecommunications (Eurescom) under a CEPT Memorandum of Understanding. Eurescom will have a network planning role for a pan-European broadband network. Investigations are under way to determine the possibility of establishing organisations external to the EC Commission to pursue the necessary broadband network R&D programs, and to help joint action between telecommunications operators, manufacturers and users for the introduction of a network.

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EUROPE European Community (STAR) (Special telecoms action for regional development)	Implementation of advanced telecoms services for economic development of less advanced regions.	STAR was aimed at helping finance the introduction of advanced telecoms services in less favoured regions (LFR) to aid economic development and generate employment. Measures to be financed included: ■ creation of infrastructure ■ promotion of supply and demand for services Infrastructure investments were aimed at: 1. integrating LFR into new advanced telecoms systems throughout the Community, through investments in land based and submarine systems, especially fibre optics and satellites; 2. digitalisation (in a move towards implementation of ISDN) ■ introducing a new signalling system between public switching centres; ■ digitalization of transmission lines and switching centres; ■ digitalization of links to final users; 3. pending ISDN, providing additional capacity for advanced services, especially for data transmission through investments in transmission lines for packet switching, data bases, and videotex services. 4. establishing and developing a coordinated cellular radio infrastructure. STAR promotion investments were aimed at training, presentation, and demonstration; undertaking technical and economic feasibility studies on the provision of new telecoms services, especially in small and medium sized companies; and aid to encourage companies to use advanced telecoms services (eg. providing studies, equipment, or investments); development of service centres; implementation of experimental distance working projects.	Total budget of STAR (1987-91) was ECU 1,500 million. In all, 80% of the money is intended for investment in infrastructures. The remaining 20% was ear marked for introduction of advanced telecoms services within firms.	STAR was part of the ERDF (European Regional Development Fund). The ERDF has invested several billion ECU in developing numerous telecoms networks. STAR was concerned solely with advanced systems. STAR was thus an important component of a European telecoms policy aimed at improving competitiveness of the European economy. This broader policy had the following main lines of action: ■ the coordinated development of telecommunications infrastructures; ■ the creation of a single, compatible, internal market in terminals and equipment; ■ the implementation of a coordinated R&D program in the field of integrated broadband communications technologies; ■ the improvement of the way in which these services and advanced networks are introduced in the LFRs; ■ the development of common European positions in international negotiations.	This program ran from 1987 to 1991 and is followed by TELEMATIQUE (see below). The program was assessed to have been successful in countries which already had a reasonable level of infrastructure (Ireland, France, N. Ireland) or where the level of investment made a significant difference to overall investment in telecoms (Portugal). Some lessons learned included: 1. one stumbling block was convincing the PTTs that advanced services (rather than just basic telephony) are important, and for economic reasons; 2. the demand stimulation side of the program was generally unsuccessful for a number of reasons, including that projects often required infrastructure developments that were not yet in place. Applications resulting from STAR include services in the areas of tourism, transport, commerce and the distributive trades; aids for design for firms in the furniture, clothing and engineering sectors; document exchange systems in the distributive, agri-food and car manufacturing sectors; telecommuting and videoconferencing systems.

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EUROPE European Community (TELEMATIQUE)	Provides Community assistance in the form of aids and grants to promote the use of advanced telecoms services in less developed regions.	TELEMATIQUE is intended to extend the applications and demand stimulation side of STAR, the assumption being that infrastructure has now been taken care of. Running from 1991 to 1993. This initiative is pursuing the introduction of advanced telecoms systems into firms, by supporting the introduction of data communication services in the public sector, and by encouraging the growth of networks within the regions concerned, and between them and the rest of the Community. Also intended to assist access to the same databases as those available in more central locations in the Community; to encourage the setting up of data networks between suppliers, producers and customers; to help firms work with or become suppliers of data services in the fields, for example, of design, accounting, financial management, joint ordering, and stock management. The initiative is also designed to instigate the setting up of data communications services and access to the relevant networks in public sectors such as health, transport, and education. In particular, TELEMATIQUE will draw on the results of Community research programs such as those generated through the RACE program, including **DRIVE** (Dedicated Road Infrastructure for Vehicle Safety in Europe), **AIM** (Advanced Informatics in Medicine), and **DELTA** (Development of European Learning through Technological Advance). (Please see separate sections on DRIVE, AIM and DELTA elsewhere in this Table.) The initiative is further meant to assist administrations to communicate more quickly with the rest of the Community using standardized documents and procedures and compatible data transmission equipment.	200 million ECU.	See STAR above.	The program encourages small and medium sized enterprises to use services linked to advanced telecoms systems, or to initiate or develop such services. Also, it is intended to promote the development in the public sector of services for data communication likely to contribute to regional development.
EUROPE (ORA, Opportunities for applications of information and communications technology in Rural Areas.) 1988	A research and development activity to stimulate the provision of technologies, services and infrastructure suited to business activities and public services with a focus on rural rather than regional development.		Approximately ECU 14 million.	Studies in support of ORA found that providers of telecoms and information technology (IT) facilities in rural areas are faced with special problems: ■ distance costs ■ uncertainty of demand ■ length of user take-up periods These may be insurmountable without either public assistance or the formation of private cooperative arrangements. Re: tariffs. The study models showed that increased tariffs reduced demand to such an extent that total revenue was lower at the higher tariff levels.	The studies showed that the economic benefits (ie, increased income and employment) accruing from telecoms and IT investment were likely to be smaller for extremely rural compared with less rural regions. This suggests that a certain minimum level of general infrastructure (not just telecoms but roads, etc.) or development is essential for sustainable economic development to result from telecoms investment, or that strictly telecoms investment is not necessarily enough. There was a call for tender in September 1991 for a mix of pilot applications and background studies for ORA. Contracts should be awarded by the end of the year. The emphasis remains very much on R&D.

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EUROPE (studies related to ORA, above)				A study undertaken by Price Waterhouse examined the benefits associated with five generic telecoms-related services, and policy initiatives that would help to ensure rural access to advanced services. (The services considered are listed in the Comments column.) The study concluded that without specific policy initiatives, access to and use of ISDN will spread very gradually into rural areas and broadband services are likely to be provided in urban areas only. Policies to encourage telecoms investments in rural areas should be concentrated on facilitating access to broadband services (except in the most remote areas). Benefits will be greatest in the category of rural areas in between urban fringe and remote areas.	The services considered in the study included: ■ **Remote conferencing.** Judged to be the only generic service requiring and justifying broadband infrastructure provision, but both demand and benefits could be substantial, especially for small businesses. ■ **Teleworking.** Felt likely to benefit fringe areas more than remote rural areas. ■ **Remote transaction services.** Felt likely only to have a significant positive effect for rural areas if non-specialised terminals were available, and there could be an adverse effect on retail services in rural areas. ■ **Access to information.** Judged the greatest impact likely to be on public services, with both direct and external benefits. ■ **Entertainment.** Extending the choice to rural households was deemed to be beneficial.

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SCOTLAND Sponsoring organisation is the Highlands and Islands Development Board (HIDB), now Highlands and Islands Enterprise (HIE), through their Telecommunications Initiative for Scotland. 1990	Implementation of regional ISDN. (Date of implementation is uncertain.)	The HIDB initiative has three main components: 1) modernization of the telecoms network infrastructure ■ replacement of 43 exchanges by ISDN exchanges (BT subsequently decided to upgrade a further 22 exchanges without public sector support) ■ upgrading and modernization of the junction network with either fibre optics or digital radio technology 2) provision of enhanced telecoms services ■ local call access to packet switched network, through provision of additional nodes into the Public Data Network (PDN) ■ providing ISDN access to all business users 3) provision of advanced information services ■ establishment of a Network Services Agency (NSA) to provide online services and host computer facilities with services including e-mail, computer conferencing and EDI. The initiative should remove any disadvantages faced by the Scottish islands in terms of availability of telecoms, and should lead to the provision of new services, such as database access, EDI, and audio conferencing.	£20m (including £16m from BT).	A highly interventionist, regional policy stance was taken in this case, which contrasts the liberalisation policy in the telecoms sector. Market led forces in the more liberal telecoms climate adversely affects service provision in rural areas. Policy makers at the regional and local level must work to diminish the disparities which might result, hence the Highlands and Island Initiative.	A study identifying how businesses and social organisations could most benefit from the Initiative made recommendations including: ■ an awareness program needed to be implemented; ■ the HIDB should carry out its own pilot by providing regional information via a telecoms link; ■ application pilots should be identified which might include EDI for the salmon farming industry, and distance training/ learning, for developing a more skilled workforce using electronic means (ISDN is recognized as offering exciting potential in many aspects of education and training); ■ the HIDB should consider helping establish telecoms service centres building on existing organisations which provide facilities for shared use. A review of the Initiative identified main lessons: ■ rationale for the Initiative remains essentially economic although social development objectives can also be met; ■ the lead agency has a responsibility to training (as described above); ■ the mix of technologies (upgraded telephony, improved public data network, and ISDN exchanges) still appears the best. ISDN's capabilities and cost saving potential remain impressive, its international availability is increasing steadily, and BT feels that by 1993/4, ISDN will be their standard business product. Meanwhile, the less advanced data network provides most facilities needed by smaller users typical in the area.

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SCOTLAND Highlands and Islands Enterprise Schools Network	Education.	HIE helped to fund the establishment of a schools network in the Highland Region, linking the main secondary schools and their computers for data exchange and other purposes, by using the infrastructure of the Highlands and Islands Initiative. The schools network provides for remote delivery of courses that were previously inaccessible. This same technology is now being used to deliver distance learning degree courses into the islands from Aberdeen University. One project under consideration to demonstrate the advantages of the speed and bandwidth available with ISDN would use the full capability of the technology, including the video channel, to deliver IT training to remote areas, and to compare the results with more conventional remote training.		In developing policies and projects in support of such trials, it is important to bear in mind that this is one type of application where it pays not to rush into an experiment. Careful project design and proper evaluation are more important than speed, if the results are to be impressive.	
SCOTLAND Highlands and Islands Enterprise Business Applications	A set of activities to raise awareness of new technology.	Activities include presentations by BT and HIE staff for local business customers whenever ISDN exchanges are installed. The presentations are pitched at a popular level, to show practical demonstrations of what the new technology can do. Local Enterprise Companies (LECs) were established, as business-led bodies delivering many of HIE's services at the local level. These have embarked on a series of strategic reviews of main sectors of the H&I economy, and ways it can be further developed. LECs also provide information resources to their local communities on what new networks offer and what local business might use them for. In addition, one or two HIE staff will talk in more depth about new technologies to a selection of companies identified by the LECs as important local influencers and role models. HIE also sees the need to provide training on ISDN technology itself, and not merely describing business applications made possible by the technology, a change back in philosophy from the recent past.			

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SCOTLAND Highlands and Islands Enterprise Sectoral Activity	Studies of the needs and potential of specific economic sectors for telecoms. The aim is to use pilot demonstrations and develop role models as a way of influencing a whole range of companies in the same sector rather than trying to convert them one by one.	Studies include: ■ the services sector. Tourism, in particular, is being drawn out for study. A pilot project being initiated looks at providing local bookings and information once a visitor has reached the area. Central systems are situated at the two main Tourist Information Centres, with an information database and direct links to booking computers in a dozen small hotels and guest houses. ■ electronic publishing. A pilot experiment recently undertaken saw an issue of one magazine prepared remotely in Shetland and, using ISDN, transmitted it south for printing and distribution. ■ teleworking. More research is being undertaken to establish the potential benefits for both teleworkers and for those who use their services. ■ telecottages, or Community Teleservice Centres (CTC). HIE has taken steps towards providing social applications in their initiative by trying out CTCs. There are signs of an interesting convergence with the teleworking concept and the unused potential of many well trained women whose circumstances keep them at home.			
WALES Report dated April 1991. Sponsoring organisation is the Development Board for Rural Wales.	Outlining of possible IT and telecom applications which meet needs in Rural Wales. Five part project from identification to implementation.	Pilot projects were identified that could be operated on the existing infrastructure, could be implemented in the short to medium term, and were low cost. These included: ■ coordinating activities of centres already involved in IT projects to reduce danger of duplication of services ■ creation of telecentres to provide telecoms and IT services ■ increasing awareness about IT and telecoms services and potential ■ encouraging increased use of IT and telecoms where benefits would result (eg. where potential users were reluctant to try new services) ■ providing IT training ■ providing information services or easier access to information ■ improving coordination and communications between Tourist Information Centres ■ provision of more information about EDI	There will be a minimum amount of investment in infrastructure from this initiative.	The pilot project scheme was deemed by policy makers to be an easy and inexpensive way of testing the effectiveness of applications in meeting current user needs.	Needs within a region may vary significantly and projects to satisfy needs must be relevant to the community.

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WEST GERMANY (Deutsche Bundespost)	Implementation of a national high speed fibre optic network for high bandwidth applications, and available for scientific networking.	Capacities up to 140 Mbps. Intended for video teleconferencing and other high bandwidth requirements, and for scientific networking including graphics transmission and access to supercomputers. Applications are being developed and installed at the Regional Computing Centre of Stuttgart University to make use of the high capacity nature of the network. Two projects of note currently taking place intend to connect research centres located 1000 km and 150 km from Stuttgart with the Cray 2 supercomputer situated there. Connections are to be at the speed of 100 Mbps. Reaching these speeds will require some time.		Tariff issues related to the high speed links currently being developed must still be negotiated with the PTT, which is in the process of deregulating.	
GERMANY	A series of projects.	1) BIGFON - a videoconferencing network, available in the major cities; has over 100 users but 40% of the revenue comes from one client; heavily subsidized. 2) BERKOM Broadband system (Berlin) - uses ATM (asynchronous transfer mode) technology to offer a range of services, notably in health.			Debate in West Germany led to recommendations in 1980 that DM300 billion be spent on a universal fibre network. A policy shift that came in with a new government placed more emphasis on competition while continuing to protect the position of the Bundespost and manufacturers like Siemens.
UNITED KINGDOM	Implementation of a high speed network to interconnect the dispersed campus of Cambridge University.	A new network using about 200 km of optical cable has recently been completed to connect existing local networks. Both the local networks and the connecting network use a design called the Cambridge Fast Ring. This architecture permits relatively cheap hardware and low complexity yet high speeds, potentially in the gigabit range. The new network has been tested at 600 Mbps.			
UNITED KINGDOM (Bishops Stortford)		BT is planning to build a network on an experimental basis, linking 240 homes and 30 businesses to TPON/BPON (Telephony/Broadband Passive Optical Network) fibres, with another 240 linked via a BIDS (Broadband Interactive Distributive System) Network.			This experiment is meant to provide information about the viability of extending such infrastructure on a much larger scale. There is unlikely to be any crucial implementation until the mid-1990s.
ITALY (An organisation of the Ministry of Scientific Research and Technology)	Implementation of a high speed national backbone connecting all research institutes and universities in Italy.	The system will use 2 Mbps leased lines and will offer four protocols (X.25, TCP/IP, DECNET, and SNA) with the intention of moving to full ISO/OSI protocols as soon as practicable. The backbone will also have a high speed link to CERN, the European high energy physics centre located near Geneva.	Expected to cost about $14 million.		Financing is to be provided by the Ministry.

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FRANCE (Minitel)	Provision of home based telecoms (videotex) services.	MINITEL. Originally implemented to replace the telephone directory but since expanded. Introduced by the French Telecoms Administration. Users now have access to some 6,000 different information and transaction services.	$2 billion.	Minitel, part of a government initiative to improve telecoms (which was much behind North American systems), included a multi-billion dollar budget. Unconfirmed figures indicate that between $6 and $9 billion could be spent on the service by 2000. The state-owned telephone company forced consumers to use Minitel by discontinuing paper based telephone directories and millions of Minitel terminals were distributed free of charge.	Minitel has been considered a huge success. So far 3.4 million terminals have been installed, reaching 30% of French people of working age. Types of services being accessed by users are changing. Whereas other services are losing subscribers, more professional information services (eg. to business people) have increased their market share from 21% to 30% during 1987. The electronic telephone directory remains the mainstay of the service.
FRANCE (Biarritz) Plan Cable		Promised to link 5.4 million homes to fibre by 1991. Fell below target and was ended in 1986. Since then, cable has spread with private investment and lower technology systems and the new government has concentrated on such things as ISDN for small business and terrestrial TV.		Part of 1981 Socialist government's commitment to high profile "information society" projects. Failure of the plan attributed to: ■ problematic role of local authorities ■ divisions in France Telecom ■ poor marketing ■ high tariffs (twice those of later private operators) ■ lack of real demand	Was ended in 1986.
FRANCE (NUMERIS)	Strategy for implementing ISDN.			More demand oriented approach than most other initiatives. Encourages private investors to join in partnerships with France Telecom which provides a third of the costs to develop specialized services for sectors such as hospitals and real estate agents. The results seem to be faster take up time than in other countries, even with high tariffs.	This demand oriented approach is thought to be the way things will go into the 1990s. Lack of success with supply driven modes is the reason.

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SWEDEN (and other Nordic Countries)	Telecottage Initiative. The official name is Community Teleservice Centres (CTSCs). Aim: to provide small, rural communities with communal access to telecoms, data processing, and computer assisted services to help offset the disadvantages of rurality.	The first telecottage was established in Sweden in 1985, and now approximately 25 are found throughout the Nordic region. Equipment in a telecottage may include: ■ computers (which may be networked), and peripherals: eg. printers, modems, software ■ telephones with hook up ■ facsimile and sometimes telex ■ reference materials ■ sometimes video and radio production equipment Services may include: ■ word processing and desktop publishing ■ data processing and management (accounting, bookkeeping) ■ training and education: eg. computer courses and access to distance education services ■ consulting on the use of IT in rural businesses ■ meeting facilities, community information ■ distance working facilities and opportunities ■ sometimes use of audio-video production equipment	Estimates are that $100,000 to $200,000 are required to establish a single telecottage. Funds are provided from national or local governments.	Telecottages are meant to be part of a strategy of economic diversification to reduce dependency on agriculture or resource based industries.	Telecottages are generally located in schools, libraries, local government buildings, or other converted or shared buildings such as a coffee shop. They may contain an office, classroom, and meeting room. Telecottages are often staffed with a *facilitator* (takes care of equipment, and acts as a computer consultant, trainer and development worker) and a part time secretary. There is no indication of whether or not the telecottage initiative has undergone any formal evaluation. One issue to be studied is that of continued support of telecottages. It was intended that telecottages will become self supporting. It now appears this is generally unlikely to happen (although at least one example exists).

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UNITED STATES (NREN)	Implementation of a high speed data network, based on the Internet and NSFNet (see below). Intended to extend not only into the traditional research, education and government arenas, but even into selected elementary and secondary schools.	NREN, The National Research and Educational Network. Being undertaken in three phases: 1) Now complete: Involved upgrading the NSFNet backbone to T1 capacity. 2) Currently under way: Involves upgrading the service provided to about 200 research institutions using a shared backbone with T3 (ie, 45 Mbps) capacity. 3) Will provide one to three gigabit per second networking services to selected research facilities and 45 Mbps networking to 1,000 sites. Deployment not expected until middle to late 1990s. However, research in gigabit technology is currently under way. Several key development areas include (1) switching systems for ultra-high speed communications links; (2) network to computer interfaces making it possible to exchange data in multiple formats and media at high speeds; (3) software programs to manage the network; (4) telecommunications links to support the network. As NREN evolves from NSFNET, a three level hierarchy will be maintained: Level 1: Campus or research organisations; Level 2: Mid-level network or regional network (defined on a regional basis or discipline basis) linking individual sites; and Level 3: The backbone itself which would physically link the different regional networks. There is a general commitment to move to ISO/OSI protocols as soon as possible. A transport layer of OSI running with TCP/IP already exists.	The entire program is projected to cost $988 million in the first year, and a total of about $2 billion over a five year period. The US Senate unanimously passed a bill that would allocate the $2 billion over 5 years. The administration has proposed a one year $638 million allocation to seed the network.	There is debate over whether NREN should be developed by government or left to market forces. Both camps agree that ultimately the network should be provided commercially. The question is whether federal funding is needed for start up. Some feel the government should not support further network development, but could perhaps provide money to subscribers for their usage needs. A government subsidized network is deemed by some to compete unfairly with fully commercial services. Two major actions will determine outcome of NREN development: funding from Congress, and NSF's decision regarding whether to put control of NSFNet into private hands or not.	Is resulting from a drive led by the National Science Foundation. The stimulus behind the drive is the fact that the existing national network, US Internet (see below), is not uniform in the type and quality of services it provides, and does not as of yet reach the entire research community. NREN would build upon and replace the Internet. Also, there is a lack of coordination in efforts to develop the kind of network deemed to be needed. A number of agencies (including the DoD, DoE, NASA and the National Science Council) have created their own networks (sometimes more than one) resulting in interconnectivity problems which include: use of a series of identification numbers resulting in problems with electronic mail (which accounts for the largest proportion of traffic on NSFNet, the National Science Foundation's network); and real time connections to advanced computers are frustrating because of delays and unexpected disconnects. Breakthroughs in enhancing service requirements depend on one cohesive national network that can be utilized by users from diverse backgrounds and areas on interest. An important feature of NREN is universality of access: it is anticipated that NREN will give researchers, students and colleges of all sizes, as well as large and small companies in every state, access to the same high performance computing tools, data banks, supercomputers, libraries, specialized research facilities and educational technologies.
UNITED STATES The INTERNET (originally financed by the Advanced Research Projects Agency of the DoD)	Forerunner of NREN. Devoted to research and education but this may change with evolution of Internet to NREN. Used as a test bed for new developments in networking.	INTERNET: The backbone of the network is the National Science Foundation Network (NSFNet, see below). The next tier consists of regional or midlevel networks. Connections to a regional network can be over links ranging from 2.4 Kbps to 1.5 Mbps. These networks are run by a variety of organisations ranging from commercial vendors to state chartered groups.		Concerns arised over whether such a network should be federally or privately owned, funded and controlled. A federally subsidized network causes unfair competition for commercially run networks, so use of the network for commercial purposes is restricted. Work is under way to loosen these restrictions, but an effective means to fairly cost and allocate costs must be determined first. Technically, all messages on the Internet should be for research and education.	Generally, network usage falls into four areas: e-mail, news, remote log-ins, and anonymous file transfer protocol (FTP). Two organisations, ANS (Advanced Network Services) and Merit manage the network. ANS is a non-profit corporation with the mission of supporting research and education networking in the US.

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UNITED STATES NSFNet (National Science Foundation)	Implementation of a high speed network backbone linking first 12 and now 16 supercomputer centres around the US.	NSFNet. Developed in the 1980s. Links between these centres were upgraded to T1 speeds (1.5 Mbps), and a central management network operations centre was established by the Merit organisation in Ann Arbor, Michigan. Growth in traffic over the network has been staggering, at an annualized rate of 20% per month for the past three years. The NSFNet backbone is managed by ANS (Advanced Network and Services), a non-profit corporation with the mission of supporting research and education networking in the US. ANS consists of the NSFNet backbone and its own commercial service. (See below.)		Use of the network for commercial purposes is restricted. These restrictions are in place because commercial information and network vendors feel a federally subsidized network could compete unfairly. Organisations using the NSFNet backbone, like ANS, are not supposed to use the network for commercial traffic, but for research and education traffic only.	In 1989, the President's Office of Science and Technology Policy issued its Federal High Performance Computing Program report which proposed four areas for R&D in technology: high performance computing systems, advanced software technology and algorithms, basic research and human resources, and a national research and education network (NREN, see above). The value of this network is reflected in its staggering growth: for the past three years, the amount of network traffic has grown at an annualized rate of 20% per month.
UNITED STATES (Regional Bell Operating Companies)	Provision of current and future advanced services of all types.	Southwestern Bell Telephone (SWB) feels broadband services are driving the needs for broadband technology and has made broadband the central concern of their network strategy. Plans are unfolding in a step process: ■ The Information Network Transition Plan (INTP) outlines the steps to be undertaken to meet a planned architectural target. The Strategic Infrastructure Plan (SIP) outlines what that target infrastructure will look like. ■ SWB's first step is to upgrade network infrastructure to be capable of supporting any broadband services. The company is deploying optical fibre ring based 1.7 Gbps and up broadband networks. Its first ring, at Houston, Texas, became operational in July, 1990. A second ring is being installed in Dallas. ■ The next step is for SWB to address broadband services. SWB's sequential plan depends critically on market demand: the company will not put in networks if they are not required. Flexibility in network sizing is possible without additional cost penalties provided that expansion occurs within a complete plan, based on an ultimate size for the network. The basic ring structure is preplanned to encompass the strategic geographical areas: expansion is largely a matter of adding nodes to the existing fibre, or of upgrading the node transmission systems; the basic imbedded fibre remains unchanged.	Size of investment has not been divulged but is described as "significant".	Are working towards providing value added services rather than pure carriage but regulatory constraints restrict this. SWB will base its broadband tariffs on a combination of cost and market value, but the final form will be subject to dialogue between the company and the FCC.	
UNITED STATES CO+RE Systems, Inc., ANS's commercial service. (See Internet)	Implementation of high bandwidth commercial service.	Initially, ANS will offer dedicated local access at 56 Kbps, T1 and T3 speeds. Dialup access should be available soon thereafter. Also, there are reportedly plans to upgrade the network to the first level in the SONET hierarchy - OC-1 - sometime in 1992.		Under current regulatory regimes, the ANS subsidiary falls into the same category as any public packet provider and is therefore free to develop its national data network without the constraints set by RBOCs. Problems might exist where ANS needs to use RBOC-provided services.	Other commercial companies providing Internet access include General Atomics (CERFnet), PSI, and UUNET Technologies.

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UNITED STATES Commercial Internet Exchange	Provision of commercial service set up as an alternative backbone that would not use NSFNet links, thus permitting commercial data transfers.	Allows all users of Alternet (UUNet's service), CERFnet, and PSInet (all commercial services) to exchange international traffic directly at no extra cost, without having to traverse the NSFNet backbone. Competes directly with ANS.			The three commercial services claim they provide nearly 100% of the commercial TCP/IP and OSI-based internetworking services in the US.
UNITED STATES Urban Telephone, a Rochester Telephone subsidiary in rural, north eastern Wisconsin	Two way interactive video distance learning network.	ERVING (see Comments) is responsible for individual classroom requirements and Urban Tel is responsible for the remainder of the network. ERVING's only request was full-motion video over a fibre optic backbone. Urban Tel will lease fibre capacity and the transmission and video switching equipment required to deliver three DS3 channels to each school. Urban will deploy Sonet multiplexers to provide the transmission facilities.			Scheduled for full deployment by January 2, 1992. Trials were to have begun August 1991. Urban Tel signed a contract to provide a video distance learning network for seven local high schools. The contract represents a coordinated effort by Urban Tel and a group of representatives from several school districts who formed a consortium, the Embarrass River Valley Instructional Network Group (ERVING). Courses taught on the network include German, creative writing, statistics and probability, oral communications, and computer applications.
UNITED STATES Mississippi 2000	Fibre optic based interactive distance learning network.	The network is the first in the US to use the public network instead of a dedicated private set up. It serves secondary schools in four separate cities. Each school has an electronic classroom equipped with transmitting and receiving equipment and PCs with advanced educational software tied together via a local area network. The network set up allows instructors at any one of the four schools, or at Mississippi State University, Mississippi University for Women, or the Mississippi Educational TV Network studio in Jackson, to simultaneously conduct a class in each of the schools.		The Mississippi 2000 project was made possible through a cooperative partnership between the public and private sectors. Actors involved are: South Central Bell who provided the network architecture and associated network products and services. Northern Telecom Inc. who provided fibre terminal equipment to carry the two way video DS3 signals from each location over the fibre cables to South Central Bell's nearest office. ADC Telecommunications who, at the request of Northern Telecom, provided the video multicast switch. The State of Mississippi provided the classroom video infrastructure materials including TV monitors, cameras, switching equipment and modifications of the TV broadcast studios. International Business Machines and Apple Computers who donated computers and other equipment and services.	

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
UNITED STATES State of Maine Education Network	A statewide university fibre optic network for distance education. One of the first steps in an integrated development strategy. (Indiana and Michigan have plans for similar networks.)	The backbone of the Community College of Maine's Interactive Television System is the University of Maine System's seven branch campuses that are linked by high capacity, fibre optic, digitally switched lines. Specially equipped electronic classrooms permit interactive classes (both audio and video) at multiple sites. In addition, the 6 technical colleges, 11 university centres, and about 50 high schools serve as receive sites for the transmission of interactive secondary and post secondary courses. The live classes are transmitted throughout the State by microwave. Each receiver site is equipped with a television, a VHS/VCR and cordless phone for students to communicate with the teacher and students in the other classrooms. In its first year in operation, 36 courses were transmitted to more than 2,500 students at 47 locations. This system already uses three DS-3 lines, and this capacity will likely not suffice for long. The University broadcasts courses to remote campuses and high schools across the State. The system also allows for special events programming and teleconferencing.	The University of Maine at Augusta, with a grant from the US Department of Education, provided the front capital that allowed New England Telephone Co. to install fibre optics throughout the State decades before this would have otherwise been economically possible.	The University of Maine faced a situation when considering expanding its fibre optic distance education network into the neighbouring New England States where it was more economical for the town to build its own system than use the public switched network (which could technically accommodate their needs), because of the way the regulated services were priced. Although the University worked out an arrangement with New England Telephone to deploy the fibre optic network within Maine, the LEC could not offer its services across the State's border because interstate traffic is the domain of the interexchange carriers (IXCs), such as AT&T, MCI and Sprint, and is regulated by the FCC. The interstate tariffed rates for DS-3 lines were so prohibitively expensive that it made more sense for the university to build digital microwave links across the State borders to link up with the networks in the other States. Although in the short term setting up private networks such as this one is more economical, the cost of many small networks will almost surely exceed the cost of extending advanced technology along the public switched network to these communities. Thus, there is a significant cost of failing to reconcile economic development and regulatory policies.	Recognizing that half of the jobs in the State would disappear by 2000, to be replaced by jobs requiring higher levels of education, the University of Maine System saw the need to increase people's access to education.

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
UNITED STATES Cleveland, Ohio A National Public Telecomputing Network - Cleveland Free-Net Community Computer System	A free, open-access, community computer system operated by Case Western Reserve University in Cleveland.	Established in July 1986, the Free-Net computer allows 24 hours-a-day access by home, office, or school computers with modems, to a wide range of electronic services and features including electronic mail to information in areas such as health, education, technology, government, arts, recreation, and the law. The hardware of the Free-Net consists of six IBM-RT Model 135 super-microcomputers and two Sun Microsystem SparkServers linked together to provide 132 megabytes of RAM and over eight gigabytes of hard disk storage. In addition to the community telephone lines, the Free-Net is connected to Case Western Research University's new fibre optic campus network (CWRUnet). This connection between a community computer system and a campus network represents an entirely new model for the delivery of campus information services.	The Cleveland Free-Net was originally made possible by donations from the Information Systems Division of AT&T and the Ohio Bell Telephone Company. These corporations were later joined by University Hospitals of Cleveland, Case Western Reserve University, and by the Free-Net users themselves who contributed over $10,000 in voluntary donations during the early days of the project. The project continues to operate via grants and donations from private foundations, corporations, government sources, and private donors. The key to the economics of operating the Free-Net is the fact that the system is literally run by the community itself. Every feature that appears on the system is there because an individual or organisation in the community contributed time, effort, and expertise to bring it online and operate it. Just as there is no charge to users to access the system, there is no charge to organisations to participate on it.	The concept behind a National Public Telecomputing Network (NPTN) like the Cleveland Free-Net is not entirely new. It is similar to public radio or public TV broadcasting, with two important differences: unlike public radio or TV, national public telecomputing is NOT subsidized by the government; and telecomputing is not yet as well established. It is a nonprofit organisation which is funded completely by voluntary membership dues from the users of the community computer systems, corporate and foundation grants, individual donations, and other fund-raising activities.	The prototype version of the Free-Net attracted over 7,000 registered users and averaged between 500 and 600 calls a day on 10 incoming phone lines. In August 1989 Free-Net II opened and currently averages over 4000 logins a day on 64 telephone lines. At the moment the Free-Net has a user base of over 13,000 persons, which is expected to grow eventually to at least 20,000 registered users in the Cleveland area. 86% of Free-Net users are over the age of 20 (average age 35.5 years) with a very deep "middle class" socio-economic penetration throughout the metropolitan area. Similar NPTNs, like the Cleveland Free-Net (online since July 1986), are in operation. These include the Youngstown Free-Net (July 1987), and the TriState Online in Cincinnati, Ohio, the Heartland Free-Net in Peoria, Illinois, and the Medina County Free-Net in Medina, Ohio (the first rural system), which all began in the first quarter of 1990. Five other cities have formally announced plans to bring additional systems online.
HAWAII	Passing of the Information Industry Bill on June 6, 1988. Aim: to "create the mechanism for the state to become a leader in the field of telecommunications and information technology in the Pacific Basin and throughout the world."	Plans are to attract other investments from the mainland and Japan to provide the building blocks for the information industry's growth in Hawaii. From the funds made available, $700,000 will be channeled for a new Hawaii Information Network Corporation (Hawaii INC.) for initial operations and studies. Another $250,000 will be given to reports and studies related to the operation of telecoms infrastructure for the state's information network. Hawaii is also in the midst of a "Strategic Program Initiative" to establish digital hubs on each of the major Hawaiian Islands. The hubs will be connected by digital radio. This digital network will interconnect certain agencies of the state government. Funds for the inter-island digital network and for three digital videoconferencing facilities were appropriated independently of the Act.	$4 million	The development of the information industry is to be incorporated into the overall state plan which is expected to result in better coordination of the investment program and a better allocation of resources.	The Act contemplates a public/private partnership in the development of information services businesses. Hawaii INC will contract with private enterprise for the provision of such services as marketing, data transmission, processing, and storage.

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
JAPAN	Implementation of a single network to serve R&D interests.	NACSIS: the Science Information Network.			
JAPAN	Information Network Systems (INS)	Substantial amounts of fibre are being laid as part of a project called INS Net-64.	$120 billion by the year 2000 (NTT expenditures. NTT competitors are also investing		
NEW ZEALAND	Implementation of interactive learning. (Distance Education)	Options: ■ print and postal system ■ narrowband ISDN, DBS; switched 64 Kbps link with databases; dial up PC; modem and telephone for the transmission of voice, data and images ■ broadband ISDN with extremely fast data transfer potential and high definition video with such techniques as CIV, CMI, CAID becoming available			Excerpted from a presentation by a representative of New Zealand Technical Correspondence Institute.
SINGAPORE	Provision of government and Commercial services. Vision/ Objective: To evolve Singapore into an information society. To lead Singapore into a developed country state by the end of the century.	A sophisticated telecoms network is being implemented which includes nationwide commercial ISDN, videoconference services (first in the region), maritime satellite, international telex, facsimile, telegram, telex and electronic data transmission to destinations worldwide. Also available are cellulars and cardphones. The system is continually enhanced to serve the needs of business. Facilities/services include: ■ Tradenet: processing of trade documents using a nationwide electronic data interchange (EDI) network hooked up to one of Singapore's two supercomputers. ■ Mass Rapid Transit: every station is connected to a mainframe computer which assesses traffic patterns in 15 minute intervals to assist in planning. ■ The port authority: receives by fax, telex or datastream, details of every cargo and uses an expert system to calculate the most efficient way to unload a ship. ■ Other services like Tradenet include: **Lawnet**, which makes case law available on computer; **Medinet**, which makes people's medical files available to doctors and hospitals; **Ecomnet**, which links all the Economic Development Boards; **Sitex**, an automated library service; **School Link**, through the Ministry of Education for the administration of 400 schools. ■ Land Data Hub: a database containing information on all land in Singapore including legal title; financial data on mortgages and taxation; public utilities information; air pollution levels. The result will be a detailed profile of every site on the island. ■ Teleview: advanced photo-videotext system, able to transmit colour photographs interactively in a fraction of a second. With Teleview, all of Singaporean society will be wired up.		The government plays a leading role by providing the complete telecommunications infrastructure. The National Computer Board (NCB) is the government agency charged with carrying out a national plan for IT. The plan outlines a strategy for building up an IT industry. Top down approach. The government's stance is highly interventionist, often forcing organisations to comply with initiatives. Singapore has no rural infrastructure to subsidize and the government is highly centralised. This strongly influences the country's ability to develop their telecommunications infrastructure.	Singapore Telecom aims to make Singapore a recognised communication hub. Plans are to achieve this by providing services at the highest level of quality and reliability, at internationally competitive prices. The government also emphasizes IT and software sector development, but human resource deficiencies in the country restrict their abilities at this time.

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
CANADA ALEX (Bell Canada's videotex service)	Provision of videotex business and home information service.	ALEX. Bell Canada provides a gateway service based on a modified iNET 2000 system at 300, 1200 and 2400 baud. As the user base grows, additional voice trunks, data lines and CPUs will be added. Transmission from the gateway to over 400 service provider's databases is through Bell Canada's Datapac network. Users use a special ALEX terminal or a personal computer to access the service. The system uses the NAPLPS graphics standard (which is of high quality), and ASCII text standard which allows access to other services such as iNET, Envoy, and major databases. Services provided include: **Information.** Classified ads, restaurant listings, news services, real estate listings, shopping, lotteries, postal codes etc. **Communications.** Chat lines and electronic messaging, for business and professionals, kids and seniors, message billboards, etc. **Entertainment and Leisure.** **Home shopping.** **Financial.** Stock market analysis, trading reports, mortgage/investment information. **Government.** Details of programs, information and services available from government. **Bell Canada's White Pages** and listing of products and services. The service is available in Montreal and Toronto, and expansion plans to Ottawa and Quebec City have been put on hold.		CRTC rulings state that Bell can provide gateway services but no other (value added) services except the White Pages listings and their product and services listings.	Through their efforts at establishing videotex, Bell has isolated key factors which they feel will make videotex services viable in Canada and globally: 1) reduction of cost, and possibly flat rate fee basis (not pay per use) 2) types of services and applications offered (users must feel they are receiving adequate value for costs). The services offered must be more than merely information and entertainment. Transactional capabilities must be included that save users' money or time. 3) must give extended reach and power to users 4) there must be interconnectivity of videotex to other services (eg. databases) Subscribers peaked at 31,000 in December 1990, and currently stand at 30,800. Only 10% are said to use the system. There are predictions the service will be discontinued. The concept is deemed to be important, but ALEX is not seen as the appropriate vehicle for providing such services.

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
CANADA Industry, Science, and Technology Canada CANARIE - Canadian Network for the Advancement of Research Industry, and Education.	Implementation of a high speed research communications network for Canada.	Access will be provided to users across Canada. Proposed physical architectures provide up to 32 nodes, with 1.5 Mbps rates for connections to major centres and regional networks, lower rates for links providing enhanced universal access.	Three options have been presented, with estimated costs of $50.5, $54.5, and $57.9 million over a five year period. The $57.9 million option is the most likely to have been accepted.	The Network, which has received approval, must be the cooperative effort of government, industry, and the academic community, with ISTC as its lead agency. All participants should have equity in the proposed Network. A discount on transmission costs could be the carriers contribution to the Network. Government intervention required: early introduction of a high speed network is not feasible privately due to long break even phase. Sponsorship by government also furthers these public goals: ■ promotes and supports R&D without having to screen projects ■ demonstrates productivity impact of new technologies, encouraging rapid adoption ■ compensates for market imperfections including over estimation of training costs and the under estimation of joint benefits of wide participation in a network ■ creates a market place for competitive provision and development of information related services	Implementation of a lower speed network would have costly implications. Productivity gains would be postponed which represents a significant loss to the economy. A lower speed network restricts the applications which can be offered and provides poorer service for those seeking to seriously collaborate or share facilities. Potential users in the academic community and in the information technology industry see the benefits which would result from the Network. Companies in research areas other than information technologies were not always sure of the benefits. Many companies will need to be provided with a low cost introduction to networks.

JURISDICTION	TYPE and PURPOSE	TECHNICAL SPECS and/or PROJECT DEV'T PLANS	DEV'T COSTS	POLICY ISSUES	COMMENTS
AUSTRALIA State Activities - Victoria	A sub-national initiative geared to strategic planning in telecoms.	Plans are to develop expertise in applications of telecoms and IT, and to conduct research and planning studies on the impact of new technologies. The initiative is not aimed solely at rural issues. Two entities established by the State to carry out plans are the Centre for International Research on Communication and Information Technologies (CIRCIT) and Knowledge Victoria. CIRCIT. This is an independent nonprofit research institution. It is associated with the Universities of Melbourne and Monash. CIRCIT will conduct research in the following areas: information economy, telecommunications infrastructure, content and communication, organisational structure, employment and training, and policy analysis and assessment. Knowledge Victoria is also a nonprofit organisation. It was established to facilitate the development of a knowledge export business for the State. Its areas of expertise are to be telematics (technology based training), knowledge transfer (between higher education institutes, venture capital and industry) and venture development (including transnational agreements.)	The State has committed A$3 million per year for the first five years for CIRCIT. Budget information is not available on Knowledge Victoria.		

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APPENDIX D3

DETAILED ASSESSMENT OF RELEVANCE OF INITIATIVES TO B.C. AND THE VANCOUVER ISLAND/COAST REGION

ASSESSMENT OF OTHER INITIATIVES (Relevance to the BC context)

ASSESSMENT CRITERIA:

All the initiatives studied had as a basic goal the use of telecommunications for economic development or diversification. This then formed the first criterium for assessing the applicability of the initiative to the BC context.

Other general criteria used to judge the applicability were as follows:

- **Scope** - is the initiative taking place in a similarly placed jurisdiction (eg. is it geared towards the international, national, regional or sub-regional level)? Are there similarities in terms of involvement by various interest or power groups?

- **Environment** - is the initiative one which could be easily replicated in a region like BC which boasts geographic diversity and a relatively low and dispersed population? Is it more relevant to urban or rural realities in the region?

- **Policy Issues** - is the initiative happening in a similar political and policy environment, or where there are similarities in terms of profit motivation, competition or other related issues?

- **Lessons** - even where the initiative did not entirely meet the above criteria, are there specific lessons that could be learned by BC?

In order to economize on time and space, the following assessments generally do not include descriptive information about the initiatives being discussed. Much of this descriptive material is provided in the *Table of Strategic Initiatives* provided in a separate Appendix to this report. It is expected that these two appendices will be used in close association for a more complete picture to be formulated.

INDIVIDUAL ASSESSMENTS OF INITIATIVES

VENUS

Scope: International

Environment and Policy Issues:

More relevant at the national level than the provincial level. Similar to the CANARIE initiative: the technology involves a central backbone with regional and specialized drops; similar number of nodes envisioned with bit rates in the same range.

Similarities exists in terms of the large and diverse geographic area that must be considered, and the diverse power group interests and policy realities to be reconciled.

Lessons:

Lessons could be learned from this initiative on how to bring together the interests of diverse governments and interest groups involved.

DELTA, AIM AND DRIVE

Scope: International

Environment:

Concerned with bringing together disparate activities in the telematiques area in order to increase inter-operability of divergent systems. The goal is to harmonize applications of information and communication technologies.

Lessons:

Main concerns are to aid in collaboration and coordination of efforts, harmonizing separate initiatives. May provide useful lessons and ideas for how to approach collaboration, to bring together the various activities being undertaken in BC.

SPRINT

Scope: International

Environment:

More broad than activities for the BC context: is taking place across national boundaries, and is concerned with all industries, not primarily the advanced technology sector. However, the initiative is aimed at helping small to medium sized enterprises, which make up the bulk of BC businesses.

Policy Issues:

The initiative is open to both public and private sector actors whose activities include helping business to exchange technology and develop innovative projects. The types of organisation involved, for example, include regional development agencies and research consultancies. A shared cost approach is taken.

RACE

Scope: International

Environment:

The scope and environment of this initiative do not closely match the BC context. The initiative is technologically similar in scope to EEC's VENUS and Canada's CANARIE, except that users are businesses and not researchers and academics. As pointed out for the VENUS initiative above, this is more relevant at the national than the provincial (ie, BC) level of jurisdiction. Also, RACE will cross international boundaries, and is only expected to reach out to major business centres (eg. towns with populations of 500,000 and above). The aim of the initiative is to overcome fragmentation and duplication of research and development, a worthwhile cause.

Lessons:

This initiative is not yet active, and like all broadband initiatives like it, potential demand and viability of the initiative are still somewhat questionable. Private funding is seen as key to support of broadband R&D. Also, education of prospective users to the advantages of the initiative is an issue to be reconciled.

STAR

Scope: Regional

Environment:

Like the Vancouver Island/Coast region, the regional areas under consideration for this initiative are not homogenous throughout, either geographically, in terms of population distribution, or with respect to economic vitality.

Lessons:

Assessment of this initiative found that success was most likely where infrastructural developments were already reasonably well under way, or where the level of investment through the initiative made a significant difference to overall investments in telecommunications.

One of the main obstacles to success was getting the telecommunications providers to recognize the need for telecommunications developments in rural areas for economic reasons. They were apprehensive without demonstrated demand for services. This parallels to situations in BC to a great extent.

TELEMATIQUE

Scope: Regional

Environment:

The focus was on less developed regions, such as can be found within the Vancouver Island/Coast region.

Policy Issues:

This initiative experimented with ways of using aid and grants to promote the use of advanced telecommunications services in less developed regions. It encouraged the use of databases, and improved access to databases from regions by providing grants and subsidies for such things as long distance access charges to established public data networks. It also encouraged access to relevant networks in the public sector, such as health networks.

Lessons:

BC has a communications grant program (PEETS), which could be adapted to focus on basic terminal equipment and long distance access costs to encourage the development of data networks.

ORA

Scope: International

Environment:

Concentration is on rural, not regional development. This means that sometimes areas that are rural, but not economically disadvantaged, are included within the focus of the work undertaken. This might be similar to the situation in the Vancouver Island/Coast region where some rural areas are not suffering as much as other areas economically.

Policy Issues:

Without public policy intervention, ISDN will spread very slowly into rural areas, and broadband will likely only be found in urban centres and major company networks.

Lessons:

Determining demand is recognized to be a problem. It is thought that tariffs could have a significant effect on demand. In order to succeed at providing technologies, services and infrastructure for rural areas, there will be a need for public assistance or effective cooperative sharing arrangements. Very rural areas are not likely to benefit from initiatives, so small urban and peri-urban areas should be the main focus.

HIGHLANDS & ISLANDS INITIATIVE

Scope: Sub-regional

Environment:

The commercial telecommunications environment is similar to BC in that the profit motive dissuades service providers from implementing ISDN and other advanced services in regional areas. Similarities also exist since geographic and population variations are found throughout both the region under consideration and the Vancouver Island/Coast region. The regions also compare in that they both consist mainly of small businesses.

Policy Issues:

This initiative was adopted since it was deemed to be necessary to develop policies to counterbalance market incentives which would likely result in disparities between urban and rural telecommunications availability. A highly interventionist policy stance was adopted.

Lessons:

The original choice of technology, including ISDN, along with a mix of other technologies (upgraded telephony and public data networks), appears to be the best choice, even after later scrutiny. ISDN's capabilities and cost saving potential seem impressive, its international availability is increasing steadily, and BT feels that by 1993/94, ISDN will be their standard business product. Meanwhile, the less advanced data network provides most facilities needed by the smaller users typical in the area.

Successful pilot projects undertaken have included developing a schools network, and using ISDN to deliver information technology training to remote areas. The Vancouver Island/Coast region may benefit from learning more about this pilot as part of the planning for providing training to unemployed people in the Port Alberni area (one of the suggested projects for the Vancouver Island/ Coast region).

Successful activities relating to business applications have included:

- providing presentations for local businesses whenever ISDN switches are installed (presentations made by BT and the sponsoring agency for this initiative);

- undertaking studies of main sectors of the economy to determine ways they can be further developed, particularly using telecommunications; some of the sectoral studies have included tourism, remote electronic publishing, teleworking and telecottages; and,

- identifying role models and influencers in the local area, and setting them up with advanced information facilities and services, to encourage other users to adopt them as well.

One of the main lessons learned through this initiative is that it does not pay off to rush into pilot projects. Careful pre-planning, implementation and evaluation are required if the outcome of the projects is to be useful and impressive.

WALES DEVELOPMENT BOARD

Scope: Sub-regional

Environment:

Has a rural focus. Focus area is similar to the BC rural context: they need to diversify to sustain themselves. Rural people's use of information technologies is not high.

Policy Issues:

Policy makers felt the pilot project scheme would be an easy and inexpensive way to test demand for, and the effectiveness of supply of, telecommunications services.

Lessons:

Needs within a regional area may vary significantly, and projects must be relevant to the actual needs of the community to be effective and successful.
The available infrastructure can be utilized to implement low cost projects in the short to medium term. The immediate aim of these projects would be to increase awareness and encourage the use of information technologies. The outcome would hopefully be increased demand for advanced technology services and facilities.

WEST GERMANY

Scope: Sub-regional

Environment:

High speed scientific network for the academic community. In the BC context, would be similar to connecting UBC, SFU, and the University of Victoria with a high speed network. Two projects of note currently taking place intend to connect research centres located 1000 km and 150 km from Stuttgart University with the Cray 2 supercomputer situated there. Tariff issues need to be resolved in an environment that is become progressively more deregulated.

BIGFON

Scope: National

Environment:

German liberalisation is proceeding slower than elsewhere in the western world. A policy shift has placed more emphasis on competition while continuing to protect the position of the Bundespost and manufacturers like Siemems. The BIGFON service is only available in the major cities in Germany. BC does not have a comparable population, nor the same population density in numerous centres.

Policy Issues:

Bigfon is heavily subsidized and receives some 40% of its revenue from one client. This cannot be considered a commercial success. A policy shift has placed more emphasis on competition while continuing to protect the position of the Busdespost and manufacturers like Siemens. This is an interesting stance that attempts to balance the conflict between liberalisation trends and the need for consolidation to develop large scale infrastructure.

Lessons:

Demand for this service was difficult to predict and has yet to materialize, although it is understood their video-conferencing is now growing internationally at an annual rate of approximately 100%.

CAMBRIDGE UNIVERSITY - UK

Scope: Sub-regional

Environment:

This initiative is directed towards connecting the dispersed campus of the University. It might be interesting to compare this environment to that of North Island College which has a number of sites. The technological solution that Cambridge has adopted is seen to be relatively inexpensive. It is unclear what purpose this particular network serves, eg. whether for instruction, CAD/CAM, research, database or administration.

ITALY

Scope: National

Environment:

Much larger jurisdiction than that of BC or the Vancouver Island/Coast region. This initiative is more like others at the national level such as VENUS or CANARIE.

Policy Issues:

Funding is being provided by the Ministry responsible for the initiative, the Ministry of Scientific Research and Technology.

MINITEL

Scope: National

Environment:

Much more centralized and controlled telecommunications environment in France than in BC.

Policy Issues:

This initiative was highly interventionist and continues to be heavily subsidized by the government. There was forced compliance to use of some key services provided by MINITEL (ie, electronic telephone directories). Also, the policy environment permitted cross-subsidization between services and terminal equipment.

Lessons:

Forced compliance played a key part in the success of this initiative.

BIARRITZ

Scope: National

Policy Issues:

Part of the day's government commitment to high profile "information society" projects.

Lessons:

Targets were never met and the plan was ended. Outcome was that private money moved to supporting cable and lower technology systems, and public money went to ISDN for small business.

Failure of the plan was attributed to:

- problematic role of local authorities
- divisions in France Telecom
- poor marketing
- high tariffs (twice those of later private operators)
- lack of real demand

NUMERIS

Scope: National

Policy Issues:

The organisers of this initiative decided to take a more demand oriented approach. The initiative also encourages private investors to join in partnerships with France Telecom which provides a third of the costs to develop specialized services for sectors such as hospitals and real estate agents.

Lessons:

The lack of success with supply driven initiatives led the organisers of this initiative to take a more cautious demand oriented stance.

In the BC context, there may be lessons from the France Telecom experience which could be applied in government thinking towards both BC Tel and BC Systems Corporation. BCSC has already undertaken projects which involve partnership or cooperation with the private sector. Perhaps BCSC could fill a similar partnering role as that played by France Telecom to encourage developments, particularly sector-specific ones in which needs might be easily identifiable. Or should BC Tel be encouraged to play that role with Government playing the role of part financier or service user?

TELECOTTAGES

Scope: Regional

Environment:

Sweden has similar geographic and population distribution realities as BC. It is also similar to BC in that its economy is heavily natural resource based. Like Canada (and BC), Sweden has a very high telephone density, ranging around 80% to 90%. The telecommunications environment differs as telecommunications in Sweden is provided by a government entity that has had a non-statutory, defacto monopoly. In 1984, however, the entity was separated from the national budget and had to find financing on the open market and they now face competition in a number of service areas including international access and value-added networks. Faced with increasingly stiff competition, profitability is playing an ever increasing role in determining service provision.

Policy Issues:

This rurally focused initiative is part of a larger government strategy to diversify and reduce dependency on agriculture or resource based industries. The idea is to provide shared access to telecommunications. The strategy is government funded.

Lessons:

It is unlikely that telecottages will become self sufficient as was originally hoped. However, the initiative has been viewed a success given the social and economic benefits that accrue to the users of the telecottages, and given the growth in the number of telecottages and their users.

It is possible that within the BC context, a similar initiative could be undertaken. It may be worth reconsidering the Open Learning Agency proposal for the development of a Community College Network, with an expanded scope to include more than strictly education related telecommunications services and facilities.

NREN

Scope: National

Environment:

This initiative is similar to CANARIE. The US telecommunications environment at this time differs from BC's since it is deregulated and competitive. One main issue surrounding the development of NREN is whether or not it should be government

funded as this would create an unfair competitive advantage affecting companies attempting to provide such services privately.

Policy Issues:

As stated above, there is some question as to whether the government should be supporting such an initiative, or whether its development should be left to market forces. Either way, it is expected that government funding will be required at least at the start up phase of any initiative of this magnitude. In this case, the US senate recently approved financing, despite the country's general lack of enthusiasm for subsidization over development through market forces.

The INTERNET

Scope: International

Environment: As above.

Policy Issues: Should the Internet be commercialized?

Lessons: The dramatic growth in use of the Internet reflects that there is demand for such high speed data networks. But government assistance to help get networks started or their capacity increased may be justified.

RBOCs

Scope: Regional

Environment: The US telecommunications environment at this time differs from BC's since it is deregulated and competitive.

Policy Issues: Given the competitive and profit motivated nature of the US telecommunications environment, developments must be demand oriented.

Lessons: There appears to be the need to prepare for demand of wide bandwidth services, but expansion is not feasible in this environment without proof of demand. A solution seems to be putting in dark fibre until demand is proven, at which time it is simple and inexpensive to provide the facilities. Expansion occurs within a complete plan as demand is shown.

CO+RE

Scope: National

Environment and Policy Issues:

Under current regulation, the ANS subsidiary falls into the same category as any public packet provider and is therefore free to develop its national data network without the constraints felt by RBOCs. Problems might arise where ANS needs to use RBOC-provided facilities.

Lessons:

There is enough demand that ANS feels secure in offering a non-subsidized commercial service.

COMMERCIAL INTERNET EXCHANGE

Scope: National

Environment: As above.

Lessons:

This is one of three commercial services competing directly with ANS. The three claim they provide nearly 100% of the commercial TCP/IP and OSI-based internetworking services in the US.

ERVING

Scope: Sub-regional

Environment: Competitive US telecommunications environment.

Lessons:

The pilot and contract represent a coordinated effort by Urban Tel and a group of representatives from several school districts who formed a consortium.

MISSISSIPPI 2000

Scope: Sub-regional

Environment: Competitive US telecommunications environment.

Policy Issues:

A cooperative partnership was set up to make this project feasible. The partners included a telecommunications carrier, government, and a number of private sector equipment and service providers.

Lessons:

The initiative is quite new and has not been scrutinized very carefully. However, it appears that the cooperation of the various players has been the key to making this initiative move ahead. Each is benefiting from the opportunity afforded by the initiative. Also, an interesting issue is the fact that this initiative claims to be the first to use the public network to provide the telecommunications network for the schools.

CLEVELAND FREE-NET COMMUNITY COMPUTER SYSTEM

(A National Public Telecomputing Network)

Scope: National

Environment: Competitive US telecommunications environment.

Policy Issues: A National Public Telecomputing Network is similar to public radio or television except that it is not subsidized by the government. It is nonprofit, and funded completely by voluntary membership dues from the users of the community computer systems, corporate and foundation grants, individual donations, and other fund-raising activities.

Lessons: This initiative has proved quite successful. There is an obvious demand for this type of service as already a 13,000 person user base has developed. The key lesson seems to be that demand can be identified where services can be offered at a reasonable price.

STATE OF MAINE EDUCATION NETWORK

Scope: National

Environment: Competitive US telecommunications market. Maine is the largest of the New England States, and is the most sparsely populated state east of the Mississippi, with density rations that match some large Midwestern States. In addition, nearly two-thirds of the state's 1.2 million citizens live in nonmetropolitan areas, typically in one of its nearly 500 small towns and villages. Despite recent growth, the state's economy is sluggish, with an average per capita income at $13,954 in 1987, compared to the national average of $15,481.

Policy Issues:

It was less expensive for the University to expand its own network to provide distance education than to use the public network, even though the latter is technologically possible, because of the way regulated services were priced.

"Although the University worked out an arrangement with New England Telephone to deploy the fibre optic network within Maine, the LEC could not offer its services across the State's border because interstate traffic is the domain of the interexchange carriers (IXCs), such as AT&T, MCI and Sprint, and is regulated by the FCC. The interstate tariffed rates for DS-3 lines were so prohibitively expansive that it made more sense for the university to build digital microwave links across the state borders to link up with the networks in the other states. Although in the short term setting up private networks such as this one is more economical, the cost of many small networks will almost surely exceed the cost of extending advanced technology along the public switched network to these communities. Thus, there is a significant cost of failing to reconcile economic development and regulatory policies."

Lessons:

To reconcile economic development and regulatory policies two approaches, or a combination thereof, are possible: create integrated economic development policies and activities, and make changes at the regulatory policy level (eg. deregulate services or change existing regulations).

HAWAII

Scope: National

Lessons:

The initiative is being orchestrated from the top down. It is highly interventionist in its approach and development plans. Partnering between the public and private sectors is deemed to be a key element of their information industry strategies.

ALEX

Scope: Sub-regional

Environment: Regulated Canadian industry. Bell Canada jurisdiction.

Policy Issues:

CRTC rulings state that Bell can provide gateway services but no other (value added) services except the White Pages listings and their product and services listings.

Lessons:

This initiative has taught Bell that costs, types of services, reach and inter-connectivity to other services are key issues to be addressed if such a service is going to succeed in the marketplace. So far, ALEX has not met with as much success as they had hoped in the Toronto and Montreal markets. Demand has waned. This contrasts somewhat to the experience with Minitel in France which has been seen to be more successful, with strong government backing.

CANARIE

Scope: National

Environment: Canadian advanced technology and research sector.

Lessons:

Cooperation between government, industry, and the academic community, with ISTC as its lead agency, is deemed to be necessary. Also, government intervention is said to be a requirement since the break even phase is too long to be sustained by a

private sector enterprise. Sponsorship by the government is justified on a social and economic basis. It is also worth noting that companies in research areas other than information technologies were not always sure of the benefits of such a network. Many companies will need to be provided with a low cost introduction to networks, as a way of increasing demand.

AUSTRALIA

Scope: Sub-national

Environment and Policy Issues:

In terms of relative size and population distribution, Australia is similar to the Vancouver Island/Coast region. About eighty percent of Australia's population live along its eastern and south-eastern coast. The rest are scattered in a few cities and large towns, and in isolated farms, sheep stations, and aboriginal settlements.

Three major carriers provide telecommunications services in Australia. The sector has been "re-regulated". There is competition in some sectors, but they also have a protected carriers' monopoly. Austel, with slightly different responsibilities, is Australia's version of the CRTC or the FCC. Australia sees the need, as in Canada, to use cross subsidies to keep telecommunications services affordable.

SINGAPORE

Scope: National

Environment:

Highly centralized government with interventionist approach to development of telecommunications infrastructures. Aim of the government is to evolve Singapore into an information society, and to lead Singapore into a developed country state by the end of the century.

Policy Issues:

The government plays a leading role by providing the complete telecommunications infrastructure. A top down approach, often using forced compliance, has been established to undertake the information society initiative. Singapore has no rural infrastructure to subsidize and the government.

Lessons:

Although the environment (in terms of government involvement, geography and population distribution) varies significantly between Singapore and the Vancouver Island/Coast region, there are interesting lessons from this initiative. Mainly, the fact that the government plays a leading role is deemed to be a key if not essential factor in the success of the Singaporean initiatives. The integrated approach to development of information facilities and services is an attractive one.